United States
Department of
Agriculture

Natural Resources
Conservation
Service

In cooperation with United
States Department of the
Interior, Bureau of Indian
Affairs and the Montana
Agricultural Experiment
Station

Soil Survey of Hill County, Montana Part I

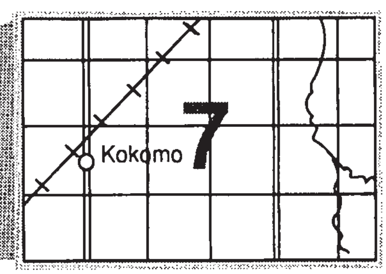
How to Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the detailed soil map units and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

Detailed Soil Maps

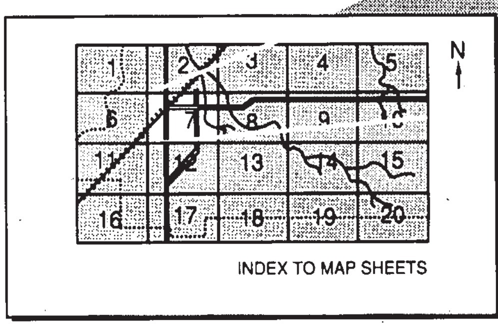
The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets,** which precedes the soil maps. Note the number of the map sheet and turn to that sheet.



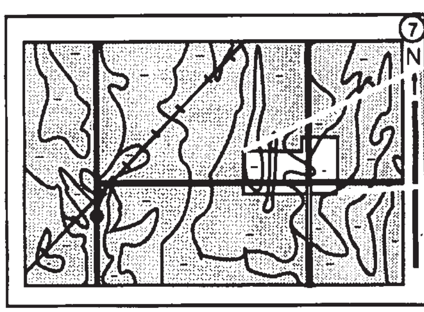
MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.

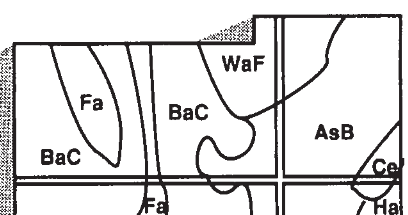


INDEX TO MAP SHEETS

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

A **State Soil Geographic Data Base** (STATSGO) is available for this survey area. This data base consists of a soils map at a scale of 1:250,000 along with groups of associated soils. It replaces the general soils map published in older surveys. This map and its data base can be useful for planning multi-county areas and map output can be tailored for specific use. For more information about the State Soil Geographic Data Base for this survey area, or for any portion of Montana, contact your local Natural Resources Conservation Service office.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the Natural Resources Conservation Service; United States Department of the Interior, Bureau of Indian Affairs; and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Hill County Conservation District and the Chippewa-Cree Tribal Council.

Cover: Wheat field in Hill County, Montana. Bear Paw Mountains are in the background.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

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Issued 2003

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Foreword

This soil survey contains information that can be used in land-planning programs in Hill County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the county is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Shirley Gammon
State Conservationist
Natural Resources Conservation Service

Soil survey of Hill County, Montana

Fieldwork by Bruce C. Evans, John M. Galbraith, Stephen C. Herriman, Donna L. Hinz, James M. Hoag, and Gregory L. Snell, Natural Resources Conservation Service.

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
United States Department of Interior, Bureau of Indian Affairs, and the Montana Agricultural Experiment Station

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in Hill County. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the county are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the county and relating their position to specific segients of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles they studied. They noted color, texture, size, and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the county and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the county, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior

of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the county, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this county do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Nature of the County

This soil survey updates the following surveys: “Soil Survey (Reconnaissance of the Northern Plains of Montana),” published in 1929; “Beaver Creek Park,” published in 1969; “Havre Area,” published in 1971; and “Soil Survey of Rocky Boy’s Indian Reservation,” published in 1984. This survey provides additional information and has larger maps that show the soils in greater detail.

Hill County is in north-central Montana (fig. 1). It has a total area of about 2,917 square miles, or 1,866,600 acres. The Canadian provinces of Alberta and Saskatchewan are to the north. Blaine County is to the east, Chouteau County to the south, and Liberty County to the west of Hill County.

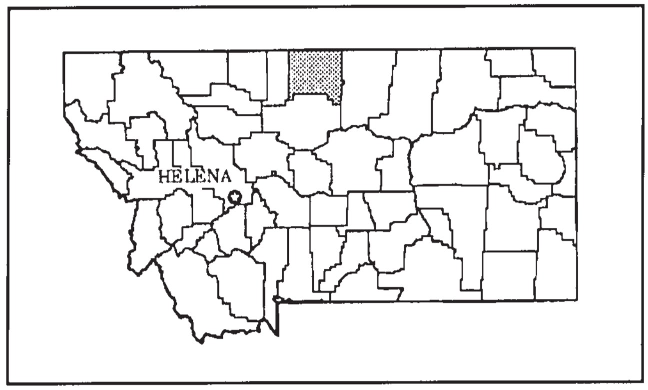

Figure 1.—Location of Hill County in Montana.

Hill County has two incorporated towns, Havre and Hingham. Other small towns include Kremlin, Gildford, Rudyard, Inverness, and Box Elder.

About 65 percent of the county is cropland, 33 percent is rangeland, and 2 percent is woodland. Hill County is recognized for its agricultural production of spring wheat, winter wheat, and barley. It is consistently among the top 10 counties in the state for production of these crops. Livestock production, including cattle, hogs, and sheep, is also an important contributor to the agricultural production in the county.

The Milk River drains most of Hill County; however, the southwestern corner is drained by the Marias River. Other drainages include Beaver, Big Sandy, Bullhook, Little Box Elder, Lodge, and Sage Creeks.

Most of the county lies in the northern glaciated uplands. This means the present landscape was formed by the glaciers. The Bear Paw Mountains in the southeast corner of the county formed from volcanic activity.

Industry, Transportation, and Recreation

The major industry in the county is agriculture, and businesses in the area are primarily related to agriculture.

Burlington Northern Railroad maintains a division headquarters in Havre. Also located in Havre is the Northern Montana College. It offers both 2- and 4-year programs. Additionally, the United States Air Force has a radar facility north of Havre,and there is some production of gas and oil in the county. Medical services for Hill County and the Hi-Line area are provided by the Northern Montana Hospital. The tourism industry brings many people through this area.

Havre is a major transportation center on the Hi-Line. Through here the Burlington Northern Railroad

moves local agricultural products and interstate shipments of goods that are destined for global markets. Amtrak provides rail passenger service. U.S. Highway 2 is the east-to-west route along the northern United States border. U.S. Highway 87 connects Havre with Great Falls and points south. There is also an extensive system of "farm to market" roads. The Wild Horse and the Willow Creek are two Canadian ports of entry in Hill County. There are also daily bus and air services to major connections.

Hill County is home to Beaver Creek Park and the Fresno Reservoir. The Bear Paw Ski Bowl is south of Havre in the Bear Paw Mountains, Beaver Creek Park is located 10 miles south of Havre, and the Fresno Reservoir is 15 miles northwest of Havre. These three places provide recreational opportunities for the people of north-central Montana.

Created in 1916, Beaver Creek Park is the largest county park in the United States. It was originally part of the Fort Assiniboine Military Reservation. The park is 1 mile wide and 17 miles long, and follows along Beaver Creek in the Bear Paw Mountains.

Four of Havre's early businessmen initially filed mining claims on land that later became the Beaver Creek Park. When they donated it as a playground for people of the area, Havre was designated as the original custodian. Many cultural features at the park were built by the Civilian Conservation Corps in the 1930s. In 1947 Hill County purchased the park. Over the years many local groups have contributed to improvement of the park.

Beaver Creek Park has two man-made lakes, Bearpaw Lake and the Lower Lake. Fishing, swimming, picnicking, and camping are enjoyed by the park visitors. There are numerous hiking and horseback riding trails that also serve as cross-country ski trails in the winter.

In the 1930s the Fresno Reservoir was built for irrigation use. Six Hi-Line towns depend on this lake for their water supply. This lake features fishing, swimming, picnicking, and camping.

Physiography, Drainage, Ground Water Resources, Oil and Gas, and Economic Deposits

Hill County, in central Montana, is adjacent to the Canadian Border. It is within the Great Plains physiographic province near the southern margin of the glaciated Missouri Plateau. Most of the county consists of a relatively flat, rolling till plain dissected by pronounced southeast-trending drainages.

Surface elevations on the glaciated uplands range from 2,450 feet above sea level, where the Milk River enters Blaine County, to 3,390 feet near Inverness. Near the Milk River a stairstepping sequence of benches has developed, with elevations increasing toward the mountains. Many streams entering the Milk River have cut through glacial till to the underlying sedimentary rocks.

The Bear Paw Mountains are in the southeastern corner of the county approximately 15 miles south of Havre. Surface elevations range from 2,700 feet at the base of Baldy Mountain to 6,916 feet at the top. Black Mountain has an elevation of 6,332 feet. Peaks that are between 4,000 and 5,000 feet include Haystack Mountain, Mount Reynolds, Number One Mountain, and Otis Mountain.

The Bear Paw Mountains contain two outstanding erosional levels that were established in the late Tertiary period. They include higher pediment surfaces that slope from an elevation of 4,600 feet at the mountain front, to broad, gravel-capped surfaces in the foothills; and lower, gravel-capped terraces above the present valley floors.

Hill County contains two major rivers. The Milk River flows southeast through the northern half of the county. It controls most of the drainage. The Marias River flows east and south through the southwest corner of the county. The present streams developed on glacial till and do not necessarily reflect the drainage pattern of the previous surface.

·Milk River is 60 to 70 feet wide and follows a meandering course through a preglacial channel of the Missouri River. At low water it is a sluggish stream entrenched 15 to 20 feet below its flood plain. Major tributaries of the Milk River include, from west to east, Sage, Big Sandy, Beaver, Bullhook, Little Boxelder, and Lodge Creeks. Sage, Big Sandy, and Lodge Creeks drain the plains area. The others originate in the Bear Paw Mountains. Major tributaries to Sage Creek include Little Sage and O'Brien Coulee Creeks. Lodge Creek flows into the Milk River east of the county border.

The Marias River controls drainage in the southwest portion of Hill County. It has no tributaries in Hill County; however, Black Coulee Creek and its tributary Flat Coulee Creek do flow into the Marias southeast of the county border. Most of the current drainages follow coulees and outwash channels of glacial meltwaters. Most coulees and channels host intermittent streams. The Chain of Lakes is part of the preglacial channel of Milk River. Big Sandy Flats and Big Sandy Creek are in the preglacial channel of the Missouri River.

Ground water resources in the county have been developed primarily from Judith River and the Eagle Formations, as well as from alluvial channels and older glacial outwash deposits. The Eagle Formation is used in the southwest corner of the county where the overlying Judith River Formation has been eroded away, and in the extreme northwest corner near Goldstone. Water from the Eagle has total dissolved solids (TDS) concentrations ranging from 980 to 7,400 mg/l. The lowest TDS concentrations are in the Goldstone areas where they range between 980 and 1,100 mg/l. Wells drilled in the basal Virgelle Sandstone commonly yield 8 to 20 gallons per minute.

The Judith River Formation is the major source of ground water throughout the county, excluding the Bear Paw Mountains and the southwest quarter where the Formation has been removed by erosion. The Judith River Formation, where it is sufficiently thick and adequately recharged, can normally produce 5 to 15 gallons of water per minute. It is soft water, with sodium bicarbonate predominating. It has total dissolved solids concentrations ranging from 900 to over 25,000 mg/l.

Hill County is within northern Montana's region of oil and gas production, between Great Falls and the Canadian border. The county contains a total of 14 natural gas fields that are currently producing and one producing oil field. The most important gas producer is the Tiger Ridge Field. It extends from eastern Blaine County into Hill County south of Havre. Most of the fields are clustered in the eastern half of Hill County.

Oil and gas are in stratigraphic traps that formed where the porosity of sandstone decreased as it graded into shale, and in structural traps, particularly in small faulted anticlines along the flanks of the Bear Paw Mountain structural uplift. These fields produce oil and gas from the Judith River and the Eagle and Sawtooth Formations. The Sawtooth Formation is the basal formation of the Lower Jurassic-aged Ellis Group. It consists of fine grained sandstone and siltstone, and underlies the surficial formations at depths greater than 3,000 feet.

The economic deposits of Hill County include sand and gravel, small coal seams, and thin beds of bentonite. Only the sand and gravel have been commercially mined.

Geology

The oldest rocks exposed in Hill County are sedimentary formations deposited during the Lower Cretaceous Period, beginning approximately 135 million years ago. They were deposited on the sea floor and coastal plains during alternating periods of emergence and submergence of a shallow sea. These repeated marine invasions deposited an alternating sequence of marine shales on the sea floor, and brackish and fresh water shales and sandstones on the coastal plain.

The marine migrations continued without interruption until 90 million years ago, in the late Cretaceous Period, when uplift of the Rocky Mountains began. Deposition continued in the county until 50 million years ago, when it was interrupted by volcanic activity during the Eocene Epoch of the Tertiary Period. This activity formed the Bear Paw Mountains. Sedimentary rocks of the plains dip gently to the northeast and are generally undisturbed except near the Bear Paw Mountains. Igneous activity in the Bear Paw Mountains is unrelated to the Rocky Mountain uplift, as it occurred after a tectonically quiet period of 20 million years.

Volcanism declined toward the end of the Eocene Epoch. The active volcanic area was adjusted by faulting and collapse, creating the rugged topography which exists today. There is evidence that the current surface is 3,000 to 10,000 feet below the original Eocene surface. Only minor faulting or deformation has occurred since then. The last earthquake reported in the county occurred in 1869. It probably originated north of the Milk River in the extreme eastern part of the county.

The landscape of Hill County was further modified by a glacier period that ended approximately 10,000 years ago. Glaciers were an important influence on the geologic history of the county; most of its soils and landforms are glacial features.

Bear Paw Mountains

The Bear Paw Mountains consist of two separate deeply eroded volcanic fields. They are separated by the Bear Paw Arch, a northeast- to east-trending band of deformed and metamorphosed Cretaceous-aged sediments. This band is an anticlinal structure 2 to 8 miles wide, running through the southeastern tip of the county.

The volcanics consist of a pile of igneous rocks approximately 1,500 feet thick. They contain a wide assortment of intrusive and extrusive rock types, including some rare potassium- and sodium-rich varieties. Included in these rock types is shonkinite, a dark, potassium-rich rock. It was named for Shonkin, a small town to the southwest, located in the Highwood Mountains. Typical volcanic soils include the Whitlash, Perma, and Belain series.

The extrusive rocks of the county consist of lava flows and pyroclastic ("broken by fire") deposits that are the result of explosive volcanic activity. Volcanic blocks thrown from the erupting lava are as large as 6 feet in diameter. The intrusions occur primarily as dikes and laccoliths (a relatively rare intrusive structure). Laccoliths are sill-like bodies that form when molten material is injected between sedimentary layers. They typically have flat floors and domed roofs.

Dikes, sills, stocks, and laccoliths make up hundreds of intrusive bodies in the Bear Paw Mountains. Most of the exposed dikes run parallel to the axis of the Bear Paw Arch, indicating regional tension operating from northwest to southeast. Radiometric dating has documented ages between 44 and 64 million years for igneous rocks of the Bear Paw Mountains.

Glaciation

Most of the landforms, drainage patterns, and associated soil development are the direct result of continental glaciation. During the four major ice ages of the late Pleistocene Epoch Successive, ice sheets advanced across north-central Montana in a generally southeastern direction. These were up to 1,000 feet thick. Four different ages of till have been recognized in Hill County. Most soils formed in the Illinoian or Wisconsin tills, or in a combination of both. The older Illinoian till has iron and manganese staining and tends to be denser than the Wisconsin till.

These ice sheets extended into Montana at least as far as the present channel of the Missouri River, eroding the existing surface and depositing widespread blankets of till. They did not completely override the Bear Paw Mountains but flowed around them, hugging the northern and western flanks. They deposited lateral moraines along the mountains and dammed the streams emerging from them. Glaciers pushed the Missouri River from its course of the Milk River to its existing channel, thus changing its final destination from Hudson Bay to the Gulf of Mexico.

Geologic Units

The sequence of rocks exposed in Hill County begins with sedimentary formations which were deposited during the Lower Cretaceous Period of the Mesozoic Era. These formations are summarized below and listed in order of decreasing age.

The classification of rock units based on their lithology is, from largest to smallest: group, formation, and member. For example, formations are subdivided into members.

Cretaceous System (135 to 165 million years). The Colorado Group contains the oldest rocks exposed in the county. It is an extensive unit consisting of marine shales, and is 2,500 feet thick in some parts of Montana. In Hill County it outcrops only in the Bear Paw Arch, and has been metamorphosed by igneous activity in that area.

The Montana Group directly overlies the Colorado Group. It is subdivided into the Telegraph Creek, Eagle Sandstone, Claggett Shale, Judith River, Bearpaw Shale, and Fox Hills Formations. Its total thickness ranges from 2,000 to 2,400 feet. The Telegraph Creek Formation has not been separately mapped in this county.

The Eagle Formation does not crop out in Hill County but is used extensively as an aquifer in areas where it is near the surface. It is 300 to 500 feet thick and consists of alternating beds of sandstone and shale, with minor amounts of coal. The basal Virgelle Sandstone Member is highly permeable and the water it contains can be highly mineralized.

Claggett Shale underlies the extreme southwest corner of Hill County. It consists primarily of a brownish-gray marine shale, and is 250 to 600 feet thick in this area. It contains beds of bentonite that are up to 2 feet thick, and erodes to badlands topography where exposed. Typical soils derived from this formation include the Neldore and Bascovy series.

The Judith River Formation is in most of the central portion of the county. It consists of tan crossbedded sandstone and gray shale with minor amounts of lignite. It was deposited in fresh water and brackish water. It is 400 to 600 feet thick and is used extensively as a regional aquifer. The water can be highly mineralized. Where exposed, it weathers to spectacular badlands containing sodic slick spots. These badlands occur along the Milk River and its tributary coulees. Soils derived from this formation typically include the Cabbart, Delpoint, Yamacall, and Benz series.

Bearpaw Shale overlies the Judith River Formation and is the surface bedrock in the northeast corner of the county. It consists of gray-to-black marine shale with numerous limestone and iron-rich concretions and bentonite seams. It ranges in thickness from 800 to 1,300 feet and represents the last marine inundation in Montana. Typical soils derived from this formation include the Neldore, Bascovy, and Weingart series.

The overlying Cretaceous-aged Fox Hills Sandstone and the younger Tertiary-aged sedimentary formations are in limited amounts in southeastern Hill County. They are composed of freshwater sandstones

and shales, and outcrop in the disturbed belt surrounding the Bear Paw Mountains.

Quaternary System (1.6 million years to present). The mantle of glacial deposits overlying most of the county consists of consolidated clayey till intermixed with glaciofluvial outwash deposits. The till is unsorted, with material ranging from clay size to boulders up to 3 feet in diameter. The till mantle ranges in thickness from 2 to 300 feet. Much of the clayey calcareous till was derived locally from Cretaceous-aged sediments outcropping in the area. Most of the included cobbles and boulders, however, were transported from northern Canada. Wind-blown loess was deposited over the till to a depth of about 2 feet. Most of this was subsequently eroded away and is now alluvial deposits within the stream channels and coulees. Typical alluvial soils include the Yamacall, Havre, and Glendive series.

In some locations knob and kettle topography has developed in the till. It consists of 10-foot high knobs from 30 to 50 feet in diameter, and is surrounded by shallow rounded kettles. Streamlined hills called drumlins are also located throughout the county, oriented in both southeast and southwest directions. These ellipsoidal till deposits are usually in parallel groups and can be stratified. Typical soils include the Hillon, Joplin, and Kevin series, occurring on knobs and drumlins, and the Phillips and Nishon series on kettles.

As ice sheets melted glaciofluvial materials were deposited, leaving a variety of localized deposits of silt, sand, and gravel. They generally consist of light colored unconsolidated silt, sand, and gravel, and are often on the floors of narrow sinuous valleys cut in the till. Outwash deposits also occur as eskers. These are sinuous ridges of stratified sand and gravel. They can be up to 1 mile long, 30 feet wide, and 10 feet high. As ice sheets retreated between the major glacial advances, silt was deposited in temporary lakes along Sage Creek in the Gildford area. It occurs as layers of light yellow to buff, even-bedded, massive silt deposits. Typical high-energy glaciofluvial soils include the Degrand, Cozberg, Attewan, and Tinsley series. Typical low-energy glaciofluvial soils include the Kremlin, Chinook, Hingham, Yamacall, and Lonna series.

Morainal ridges occur throughout the county as well. These are typically closely spaced low ridges, and are comprised of unstratified material. Eskers and drumlins are oriented in the direction of ice and meltwater movement. Morainal ridges (washboard moraines) are usually oriented in groups perpendicular to the retreating glacier.

Climate

The "Temperature and Precipitation" table gives data for the county as recorded at Fort Assinniboine, Guilford, Havre, Rudyard, and Simpson, Montana for the period 1961 to 1990. The "Freeze Dates in Spring and Fall" table shows probable dates of the first freeze in fall and the last freeze in spring. The "Growing Season" table provides data on probable length of the growing season. Growing degree days, as shown in the table, are equivalent to heat units. During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal growing degree accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Temperature and Precipitation

(Recorded in the period 1961-90 at Fort Assinniboine, Guilford, Havre, Rudyard, and Simpson, Montana)

Month	Temperature (Degrees F)						Precipitation (Inches)				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature more than--	2 years in 10 will have-- Minimum temperature less than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than	2 years in 10 will have-- More than	Average number of days with 0.10 inch or more	Average total snowfall
FORT ASSINNIBOINE											
January-----	26.7	4.7	15.7	57	-33	7	0.51	0.16	0.82	1	5.4
February----	33.8	10.6	22.2	63	-26	12	0.34	0.11	0.53	1	4.5
March-------	44.7	19.6	32.2	73	-17	48	0.58	0.20	0.93	1	4.0
April-------	59.2	30.2	44.7	85	4	196	1.00	0.45	1.59	3	1.4
May---------	70.2	40.4	55.3	92	24	474	1.99	0.71	3.06	4	0.0
June--------	79.6	48.6	64.1	99	34	711	1.88	0.81	2.79	4	0.0
July--------	86.9	52.8	69.8	102	40	906	1.41	0.70	2.21	4	0.0
August------	86.2	51.3	68.8	103	36	876	1.37	0.34	2.26	2	0.0
September---	73.2	41.3	57.3	97	23	508	1.34	0.42	2.10	3	0.0
October-----	61.9	32.3	47.1	86	8	262	0.60	0.19	0.98	1	0.4
November----	42.9	18.7	30.8	70	-16	45	0.38	0.10	0.63	1	3.2
December----	30.0	7.5	18.7	59	-33	9	0.55	0.18	0.88	1	6.7
Yearly:											
Average---	58.0	29.8	43.9	--	--	--	--	--	--	--	--
Extreme---	111	-49	--	105	-38	--	--	--	--	--	--
Total-----	--	--	--	--	--	4,055	11.96	8.76	14.81	26	25.6
GUILFORD											
January-----	26.0	4.0	15.0	56	-33	5	0.40	0.13	0.65	1	5.4
February----	33.6	10.5	22.1	62	-24	9	0.25	0.06	0.41	0	2.8
March-------	43.3	18.9	31.1	71	-18	33	0.50	0.17	0.80	1	3.1
April-------	57.0	29.4	43.2	83	3	165	0.82	0.28	1.32	2	1.6
May---------	68.2	39.6	55.9	91	23	430	1.87	0.72	2.83	4	0.2
June--------	77.2	47.6	62.4	97	32	659	2.09	0.90	3.10	4	0.0
July--------	84.5	51.6	68.0	100	38	863	1.31	0.47	2.01	3	0.0
August------	83.3	50.3	66.8	102	36	831	1.25	0.47	2.06	3	0.0
September---	71.1	40.3	55.7	94	22	474	1.18	0.34	1.85	2	0.0
October-----	60.2	30.8	45.5	84	6	221	0.48	0.16	0.75	1	0.4
November----	41.6	17.5	29.6	70	-16	34	0.27	0.10	0.47	1	1.8
December----	29.2	6.8	18.0	59	-34	5	0.42	0.11	0.71	1	6.6
Yearly:											
Average---	56.3	29.0	42.6	--	--	--	--	--	--	--	--
Extreme---	110	-44	--	103	-37	--	--	--	--	--	--
Total-----	--	--	--	--	--	3,729	10.83	8.22	13.11	23	21.8

* See footnote at end of table.

Temperature and Precipitation—Continued

(Recorded in the period 1961-90 at Fort Assinniboine, Guilford, Havre, Rudyard, and Simpson, Montana)

Month	Temperature (Degrees F): Average daily maximum	Average daily minimum	Average	2 years in 10 will have— Maximum temperature more than—	2 years in 10 will have— Minimum temperature less than—	Average number of growing degree days*	Precipitation (Inches): Average	2 years in 10 will have— Less than	2 years in 10 will have— More than	Average number of days with 0.10 inch or more	Average total snowfall
HAVRE											
January-----	24.3	3.3	13.8	57	-35	6	0.54	0.20	0.86	1	8.4
February----	32.1	10.2	21.2	62	-27	11	0.36	0.15	0.56	1	5.6
March-------	42.6	19.7	31.1	72	-17	41	0.66	0.25	1.01	2	7.4
April-------	56.7	30.8	43.8	84	4	181	0.94	0.39	1.46	2	6.4
May---------	67.9	41.5	54.7	91	26	458	1.66	0.70	2.57	4	1.4
June--------	77.4	49.5	63.4	99	35	703	1.76	0.74	2.63	4	0.0
July--------	85.1	53.9	69.5	102	41	914	1.40	0.39	2.22	3	0.0
August------	83.7	52.5	68.1	104	38	871	1.23	0.36	2.08	2	0.0
September---	70.9	41.9	56.4	96	24	497	1.18	0.29	1.88	2	0.4
October-----	59.7	31.5	45.6	85	7	226	0.53	0.18	0.82	1	1.9
November----	41.3	17.6	29.5	70	-17	38	0.39	0.11	0.63	1	4.7
December----	28.2	6.6	17.4	59	-36	7	0.54	0.17	0.84	1	7.8
Yearly:											
Average---	55.8	29.9	42.9	—	—	—	—	—	—	—	—
Extreme---	111	-52	—	105	-40	—	—	—	—	—	—
Total-----	—	—	—	—	—	3,953	11.19	8.17	13.94	24	44.1
RUDYARD											
January-----	25.8	4.0	14.9	58	-31	8	0.39	0.10	0.71	1	7.3
February----	32.7	10.4	21.5	62	-25	12	0.25	0.14	0.48	1	3.9
March-------	41.8	19.2	30.5	69	-15	36	0.42	0.21	0.67	1	4.6
April-------	55.5	30.2	42.8	82	6	157	0.87	0.26	1.47	2	1.5
May---------	67.2	40.4	53.8	89	25	403	1.60	0.65	2.40	3	0.3
June--------	76.1	48.1	62.1	96	34	639	2.16	1.27	3.27	5	0.0
July--------	83.2	52.1	67.6	99	40	815	1.31	0.45	2.01	3	0.0
August------	82.7	51.5	67.1	101	37	815	1.08	0.46	1.60	2	0.0
September---	69.8	40.7	55.2	94	21	441	1.09	0.26	1.81	2	0.5
October-----	59.7	32.0	45.9	83	9	222	0.39	0.09	0.70	1	0.7
November----	40.7	17.4	29.0	68	-15	33	0.29	0.11	0.55	1	2.4
December----	29.2	6.2	17.7	59	-33	6	0.39	0.17	0.71	1	5.6
Yearly:											
Average---	55.4	29.3	42.3	—	—	—	—	—	—	—	—
Extreme---	106	-43	—	102	-35	—	—	—	—	—	—
Total-----	—	—	—	—	—	3,586	10.23	7.12	12.25	23	26.8

* See footnote at end of table.

Temperature and Precipitation--Continued

(Recorded in the period 1961-90 at Fort Assinniboine, Guilford, Havre, Rudyard, and Simpson, Montana)

Month	Temperature (Degrees F)						Precipitation (Inches)				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature more than--	2 years in 10 will have-- Minimum temperature less than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than	2 years in 10 will have-- More than	Average number of days with 0.10 inch or more	Average total snowfall
SIMPSON											
January-----	22.6	-0.1	11.3	55	-35	3	0.31	0.14	0.50	1	5.5
February----	30.6	7.0	18.8	59	-29	5	0.23	0.08	0.40	0	3.8
March-------	41.5	16.8	29.2	70	-20	26	0.41	0.13	0.65	1	5.0
April-------	56.8	28.1	42.4	83	3	151	0.61	0.17	1.00	1	3.6
May---------	69.1	38.3	53.7	92	21	425	1.51	0.60	2.27	3	0.3
June--------	77.8	46.1	61.9	98	31	631	2.02	0.70	3.10	4	0.0
July--------	85.2	50.4	67.8	101	36	823	1.43	0.42	2.25	3	0.0
August------	84.3	49.0	66.6	103	32	819	1.27	0.43	1.97	3	0.0
September---	71.9	38.3	55.1	95	19	451	1.08	0.36	1.81	2	0.4
October-----	69.7	28.7	44.2	85	4	192	0.40	0.14	0.70	1	1.1
November----	39.9	14.6	27.2	68	-21	23	0.31	0.12	0.56	1	3.9
December----	26.8	3.3	15.1	57	-35	4	0.33	0.12	0.51	1	5.2
Yearly:											
Average---	55.5	26.7	41.1	--	--	--	--	--	--	--	--
Extreme---	109	-47	--	104	-39	--	--	--	--	--	--
Total-----	--	--	--	--	--	3,552	9.92	7.35	12.31	21	28.7

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Fort Assinniboine, Guilford, Havre, Rudyard, and Simpson, Montana)

Probability	Temperature: 24 °F or lower	Temperature: 28 °F or lower	Temperature: 32 °F or lower
FORT ASSINNIBOINE			
Last freezing temperature in spring: (January-July)			
1 year in 10 later than--	May 5	May 19	May 30
2 years in 10 later than--	April 30	May 14	May 25
5 years in 10 later than--	April 21	May 4	May 15
First freezing temperature in fall: (August-December)			
1 year in 10 earlier than--	Sept. 20	Sept. 12	Sept. 4
2 years in 10 earlier than--	Sept. 26	Sept. 17	Sept. 9
5 years in 10 earlier than--	Oct. 7	Sept. 28	Sept. 19
GUILFORD			
Last freezing temperature in spring: (January-July)			
1 year in 10 later than--	May 7	May 22	June 9
2 years in 10 later than--	May 2	May 17	June 3
5 years in 10 later than--	April 22	May 9	May 23

Table 2.--Freeze Dates in Spring and Fall--Continued

(Recorded in the period 1961-90 at Fort Assinniboine, Guilford, Havre, Rudyard, and Simpson, Montana)

Probability	Temperature 24 °F or lower	28 °F or lower	32 °F or lower
GUILFORD			
First freezing temperature in fall: (August-December)			
1 year in 10 earlier than--	Sept. 18	Sept. 10	Sept. 3
2 years in 10 earlier than--	Sept. 23	Sept. 15	Sept. 8
5 years in 10 earlier than--	Oct. 3	Sept. 24	Sept. 16
HAVRE			
Last freezing temperature in spring: (January-July)			
1 year in 10 later than--	May 1	May 19	May 29
2 years in 10 later than--	April 26	May 13	May 23
5 years in 10 later than--	April 17	May 2	May 12
First freezing temperature in fall: (August-December)			
1 year in 10 earlier than--	Sept. 23	Sept. 14	Sept. 6
2 years in 10 earlier than--	Sept. 28	Sept. 19	Sept. 11
5 years in 10 earlier than--	Oct. 9	Sept. 28	Sept. 20

Table 2.--Freeze Dates in Spring and Fall--Continued

(Recorded in the period 1961-90 at Fort Assinniboine, Guilford, Havre, Rudyard, and Simpson, Montana)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
RUDYARD			
Last freezing temperature in spring: (January-July)			
1 year in 10 later than--	May 5	May 17	May 30
2 years in 10 later than--	April 30	May 12	May 25
5 years in 10 later than--	April 19	May 3	May 15
First freezing temperature in fall: (August-December)			
1 year in 10 earlier than--	Sept. 18	Sept. 7	Sept. 3
2 years in 10 earlier than--	Sept. 24	Sept. 12	Sept. 7
5 years in 10 earlier than--	Oct. 5	Sept. 22	Sept. 15
SIMPSON			
Last freezing temperature in spring: (January-July)			
1 year in 10 later than--	May 14	May 27	June 21
2 years in 10 later than--	May 9	May 22	June 13
5 years in 10 later than--	April 28	May 13	May 29

Table 2.--Freeze Dates in Spring and Fall--Continued

(Recorded in the period 1961-90 at Fort Assinniboine, Guilford, Havre, Rudyard, and Simpson, Montana)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
SIMPSON			
First freezing temperature in fall: (August-December)			
1 year in 10 earlier than--	Sept. 10	Sept. 6	Aug. 23
2 years in 10 earlier than--	Sept. 15	Sept. 10	Aug. 28
5 years in 10 earlier than--	Sept. 25	Sept. 18	Sept. 5

Table 3.--Growing Season

(Recorded in the period 1961-90 at Fort Assinniboine, Guilford, Havre, Rudyard, and Simpson, Montana)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
FORT ASSINNIBOINE			
9 years in 10	144	123	105
8 years in 10	152	131	112
5 years in 10	168	146	127
2 years in 10	184	161	141
1 year in 10	192	169	149
GUILFORD			
9 years in 10	143	120	97
8 years in 10	150	126	103
5 years in 10	163	137	115
2 years in 10	176	148	127
1 year in 10	183	153	134
HAVRE			
9 years in 10	152	128	111
8 years in 10	160	135	117
5 years in 10	174	148	129
2 years in 10	188	161	142
1 year in 10	196	168	148

Table 3.--Growing Season--Continued

(Recorded in the period 1961-90 at Fort Assinniboine, Guilford, Havre, Rudyard, and Simpson, Montana)

Probability	Daily minimum temperature during growing season		
	Higher than 24 oF	Higher than 28 oF	Higher than 32 oF
	Days	Days	Days
RUDYARD			
9 years in 10	146	125	106
8 years in 10	154	132	113
5 years in 10	170	144	126
2 years in 10	186	157	139
1 year in 10	194	163	146
SIMPSON			
9 years in 10	127	108	76
8 years in 10	135	115	84
5 years in 10	150	127	100
2 years in 10	164	140	116
1 year in 10	172	146	124

Formation and Classification of the Soils

This section relates the soils in the county to the major factors of soil formation and describes the system of soil classification. The classification and extent of the soils in this county are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

Formation of the Soils

Climate

Climate, an active force in the formation of soils, is determined mainly be temperature and precipitation. In Hill County winters are cold, springs are cool and moist, and summers are hot and dry. Arctic cold waves, and gusty warm southwest winds called Chinooks, are a part of seasonal weather patterns. Erosion and alternate freezing and thawing break rocks into a material in which soils form. This weathered material is further broken down by chemical reactions such as solution and hydration.

Precipitation and temperature affect the kind and amount of vegetation that grows on a soil. Vegetation decays to produce organic matter in the soil. Soils that have cool temperatures and high precipitation generally contain more organic matter and are dark colored. Soils with warm temperatures and low precipitation generally contain less organic matter and are light colored.

The average annual precipitation ranges from about 10 to 12 inches in the majority of the county to 22 inches in the Bear Paw Mountains. The average annual temperature varies from 38 to 45 degrees F.

Living Organisms

Living organisms are active in the formation of soils. Plants, animals, insects, and micro-organisms affect gains or losses in the organic matter in the soil, plant nutrients, and changes in porosity and structure.

Roots, rodents, and insects penetrate the soil and alter its structure. Leaves, roots, and entire plants that remain on the surface layer are changed to humus by micro-organisms, by chemicals in the soil, and by insects. Fungi and algae also contribute to the decomposition of bedrock. Animals increase porosity by burrowing through the soil and leaving open channels for the movement of water and air. Common rodents in the area are ground squirrels, badgers, prairie dogs, and rabbits.

Vegetation on the plains of Hill County consists of short grasses, mid grasses, and shrubs. Tall grasses, Ponderosa pine, Douglas fir, and lodgepole pine are in the Bear Paw Mountains.

Topography

Topography is determined by glaciation and the age and resistance of geologic formations to erosion by wind and water. It influences soil development through its effect on drainage and runoff.

On uplands the number and distinctness of soil horizons generally decrease as the slope increases. Soils on steep slopes with rapid runoff have many characteristics similar to those of soils formed in arid climates. An example is the Hillon soil that is moderately steep or steep. Most common in Hill County are the nearly level to moderately sloping soils. The Telstad soil, nearly level to moderately sloping, is an example.

Parent Material

Most soils in the county formed in glacial till. Some of the soils formed in alluvium derived from mixed sources, and a few soils formed in material that weathered from shale or sandstone. Soils in the Bear Paw Mountains formed from igneous rocks.

Soils forming in glacial till, such as the loamy Telstad and Joplin series or the clayey Scobey and Kevin series, have a high bulk density. Soils that formed in sandstone and shale, such as the Cabbart and Delpoint series, are generally loamy. Soils forming from shale, like the Neldore and Bascovy series, are clayey. Soils forming in mixed alluvium and derived from glacial till, sandstone, or shale, are loamy. The Havre series is an example of this. Soils that formed from igneous rocks, such as the Perma series, are loamy.

Most soils on the glaciated till plain have accumulated lime, sodium, and other salts from the parent material. These accumulations cause soils to range from neutral to strongly alkaline. Salts and sodium make these soils slightly to moderately saline or sodic. This limits the kind and amount of plant cover on the soil. Soils in the Bear Paw Mountains have no accumulations and are slightly acid to neutral.

Time

Changes taking place in a soil over long periods of time are called soil genesis. Distinct horizons, or layers, develop in the soils as a result of these changes. The length of time parent materials have been in place and exposed to climate and living organisms is generally reflected in the degree to which the soil profile has developed. The kinds and arrangement of layers are called the soil morphology. They are described in terms of color, texture, structure, consistence, thickness, permeability, and chemistry.

Soils are classified as ranging from young to mature. The age of a soil is determined from the thickness of the A horizon, content of clay and organic matter, depth to which soluble material is leached, and the form and distribution of calcium carbonate and gypsum in the soil.

Young soils show very little profile development. Havre loam, a soil of the Entisol order, is an example of a young soil. It is on a flood plain adjacent to a flowing stream. The soil contains little organic matter to form an A horizon, it has little clay accumulation, and little translocation of carbonates has occurred.

The Evanston soil formed in parent material similar to the Havre loam, but is much older. This soil formed in alluvium on uplands. It contains enough organic matter to have a dark colored A horizon, it has a distinct clay accumulation in a Bt horizon, and nearly all the carbonates have been leached to a depth of about 13 inches.

Many of the sloping and steep soils and the shallow and very shallow soils appear to have been in the formation process about as long as some of the more developed, less sloping soils. However, erosion has removed the soil as fast as it formed. In this case the effect of time has been offset by the effect of relief.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The table "Classification of the Soils" in Parts I and II of this publication shows the classification of the soils in the county. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variable within the orders. The last syllable in the name of a suborder indicates the order. An example is Boroll (*Bor*, meaning cool, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Argiborolls (*Arg*, meaning having an argillic horizon, plus *boroll*, the suborder of the Mollisols that has a cool climate).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Argiborolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup

preceded by terms that indicate soil properties. An example is fine, montmorillonitic Typic Argiborolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series. An example is the Bearpaw series.

Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Absher	Fine, montmorillonitic Typic Natriboralfs
Ambrant	Coarse-loamy, mixed, frigid Typic Ustochrepts
Attewan	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Bascovy	Fine, montmorillonitic, frigid Leptic Udic Haplusterts
Bearpaw	Fine, montmorillonitic Typic Argiborolls
Beaverton	Loamy-skeletal over sandy or sandy-skeletal, mixed Typic Argiborolls
Belain	Coarse-loamy, mixed Typic Haploborolls
Benz	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Blacksheep	Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents
Bowery	Fine-loamy, mixed Pachic Haploborolls
Bullhook	Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Busby	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Cabba	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cabbart	Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents
Chinook	Coarse-loamy, mixed Aridic Haploborolls
Cozberg	Coarse-loamy, mixed Aridic Haploborolls
Creed	Fine, montmorillonitic Typic Natriboralfs
Degrand	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Delpoint	Fine-loamy, mixed, frigid Aridic Ustochrepts
Dimmick	Fine, montmorillonitic, frigid Vertic Epiaquolls
Eagleton	Fine-loamy, mixed, frigid Cumulic Endoaquolls
Elkner	Coarse-loamy, mixed Typic Cryochrepts
Elloam	Fine, montmorillonitic Typic Natriboralfs
Enbar	Fine-loamy, mixed Cumulic Haploborolls
Ethridge	Fine, montmorillonitic Aridic Argiborolls
Evanston	Fine-loamy, mixed Aridic Argiborolls
Farnuf	Fine-loamy, mixed Typic Argiborolls
Ferd	Fine, montmorillonitic Glossic Eutroboralfs
Fortbenton	Fine-loamy, mixed Aridic Haploborolls
Garlet	Loamy-skeletal, mixed Typic Cryochrepts
Gerdrum	Fine, montmorillonitic Typic Natriboralfs
Glendive	Coarse-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hanly	Sandy, mixed, frigid Aridic Ustifluvents
Harlake	Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents
Havre	Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hedoes	Coarse-loamy, mixed Pachic Haploborolls
Hillon	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Hingham	Coarse-silty, mixed Aridic Haploborolls
Joplin	Fine-loamy, mixed Aridic Argiborolls
Kenilworth	Fine-loamy, mixed Aridic Argiborolls
Kevin	Fine-loamy, mixed Aridic Argiborolls
Kobase	Fine, montmorillonitic, frigid Aridic Ustochrepts
Korchea	Fine-loamy, mixed (calcareous), frigid Mollic Ustifluvents
Kremlin	Fine-loamy, mixed Aridic Haploborolls
Laceycreek	Fine loamy, mixed Pachic Udic Argiborolls

Classification of the Soils--Continued

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Lonesome	Sandy over loamy, mixed (calcareous), frigid Aridic Ustorthents
Lonna	Fine-silty, mixed, frigid Aridic Ustochrepts
Lostriver	Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents
Macar	Fine-loamy, mixed, frigid Typic Ustochrepts
Marias	Fine, montmorillonitic, frigid Chromic Udic Haplusterts
Marmarth	Fine-loamy, mixed Aridic Argiborolls
Marvan	Fine, montmorillonitic, frigid Sodic Haplusterts
*McKenzie	Fine, montmorillonitic, frigid Chromic Endoaquerts
Neldore	Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents
Nesda	Sandy-skeletal, mixed Fluventic Haploborolls
Nishon	Fine, montmorillonitic, frigid Typic Albaqualfs
Nobe	Fine, montmorillonitic (calcareous), frigid Oxyaquic Ustorthents
Obrien	Fine-loamy, mixed Pachic Haploborolls
Perma	Loamy-skeletal, mixed Typic Haploborolls
Phillips	Fine, montmorillonitic Typic Eutroboralfs
Scobey	Fine, montmorillonitic Aridic Argiborolls
Straw	Fine-loamy, mixed Cumulic Haploborolls
Tally	Coarse-loamy, mixed Typic Haploborolls
Telstad	Fine-loamy, mixed Aridic Argiborolls
Thibadeau	Fine-loamy, mixed (calcareous), frigid Oxyaquic Ustifluvents
Thoeny	Fine, montmorillonitic Typic Natriboralfs
Tinsley	Sandy-skeletal, mixed, frigid Typic Ustorthents
Twilight	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Vida	Fine-loamy, mixed Typic Argiborolls
Waltham	Fine, montmorillonitic Typic Natriboralfs
Warwood	Fine-loamy, mixed Glossic Cryoboralfs
Weingart	Fine, montmorillonitic Typic Natriboralfs
Wheatbelt	Very-Fine, montmorillonitic, frigid Sodic Epiaquerts
Whitlash	Loamy-skeletal, mixed Lithic Haploborolls
Williams	Fine-loamy, mixed Typic Argiborolls
Winkler	Loamy-skeletal, mixed, frigid Typic Ustochrepts
Yamacall	Fine-loamy, mixed, frigid Aridic Ustochrepts
Yawdim	Clayey, montmorillonitic (calcareous), frigid, shallow Aridic Ustorthents
Yetull	Mixed, frigid Typic Ustipsamments
Zahill	Fine-loamy, mixed (calcareous), frigid Typic Ustorthents

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
13A	McKenzie clay, 0 to 1 percent slopes	5,079	0.3
16B	Degrand loam, 0 to 4 percent slopes	2,645	0.1
22E	Hillon loam, 15 to 25 percent slopes	12,492	0.7
22F	Hillon loam, 25 to 60 percent slopes	20,334	1.1
24A	Hanly loamy fine sand, 0 to 2 percent slopes	894	0.1
27B	Attewan loam, 0 to 4 percent slopes	1,385	0.1
28A	Nishon clay loam, 0 to 1 percent slopes	10,082	0.5
30A	Marvan clay, 0 to 2 percent slopes	3,365	0.2
30C	Marvan clay, 2 to 8 percent slopes	836	*
31A	Ferd loam, 0 to 2 percent slopes	2,828	0.2
32A	Kobase clay loam, 0 to 2 percent slopes	5,133	0.3
33A	Phillips loam, 0 to 2 percent slopes	9,928	0.5
34A	Dimmick clay, 0 to 1 percent slopes	4,069	0.2
36A	Chinook fine sandy loam, 0 to 2 percent slopes	10,153	0.5
36C	Chinook fine sandy loam, 2 to 8 percent slopes	4,173	0.2
37A	Evanston loam, 0 to 2 percent slopes	21,330	1.1
51A	Wheatbelt clay, 0 to 1 percent slopes	13,996	0.8
53D	Beaverton gravelly loam, 4 to 15 percent slopes	460	*
55A	Benz clay loam, 0 to 2 percent slopes	1,198	0.1
60A	Havre loam, 0 to 2 percent slopes	8,899	0.5
62C	Weingart complex, 2 to 8 percent slopes	3,110	0.2
72F	Zahill clay loam, 25 to 60 percent slopes	20,197	1.1
74B	Marias silty clay, 0 to 4 percent slopes	3,481	0.2
75B	Farnuf loam, 0 to 4 percent slopes	745	*
75C	Farnuf loam, 4 to 8 percent slopes	742	*
76B	Bowery loam, 0 to 4 percent slopes	609	*
76C	Bowery loam, 4 to 8 percent slopes	1,479	0.1
76D	Bowery loam, 8 to 15 percent slopes	1,282	0.1
78A	Lostriver clay, 0 to 2 percent slopes	4,439	0.2
79B	Yamacall loam, 0 to 4 percent slopes	2,050	0.1
81A	Glendive fine sandy loam, 0 to 2 percent slopes	4,618	0.3
84A	Bullhook clay loam, 0 to 2 percent slopes	4,872	0.3
90A	Harlake clay, 0 to 2 percent slopes	3,208	0.2
92B	Marmarth loam, 0 to 4 percent slopes	1,127	0.1
93D	Tally fine sandy loam, 4 to 15 percent slopes	388	*
96B	Fortbenton fine sandy loam, 0 to 4 percent slopes	24,270	1.3
96C	Fortbenton fine sandy loam, 4 to 8 percent slopes	3,142	0.2
98B	Kremlin loam, 0 to 4 percent slopes	20,185	1.1
99A	Thibadeau clay loam, 0 to 2 percent slopes	4,562	0.2
110D	Laceycreek loam, 8 to 15 percent slopes	1,000	*
115B	Thoeny-Elloam complex, 0 to 4 percent slopes	15,222	0.8
171C	Delpoint-Cabbart loams, 2 to 8 percent slopes	2,030	0.1
172C	Delpoint complex, 2 to 8 percent slopes	3,272	0.2
182F	Garlet-Elkner complex, 25 to 70 percent slopes	6,577	0.4
191F	Winkler-Ambrant complex, 25 to 60 percent slopes	5,104	0.3
200F	Badland	2,326	0.7
203F	Cabba-Rock outcrop complex, 25 to 60 percent slopes	630	*
204F	Cabba-Zahill complex, 25 to 60 percent slopes	2,723	0.2
205F	Cabba-Macar loams, 15 to 60 percent slopes	450	*
211F	Cabbart-Rock outcrop complex, 25 to 60 percent slopes	8,576	0.4
212F	Cabbart-Hillon loams, 25 to 60 percent slopes	9,378	0.5
213E	Cabbart-Yawdim complex, 8 to 25 percent slopes	591	*
221D	Hillon-Kevin clay loams, 8 to 15 percent slopes	5,827	0.3
224D	Hillon-Joplin loams, 8 to 15 percent slopes	22,250	1.2
241A	Hanly loamy fine sand, 0 to 2 percent slopes, occasionally flooded	3,000	0.2
251D	Bascovy-Neldore clays, 2 to 15 percent slopes	3,454	0.2
262A	Absher-Gerdrum complex, 0 to 2 percent slopes	2,121	0.1
272C	Attewan-Tinsley complex, 2 to 8 percent slopes	2,988	0.2
304A	Marvan-Nobe clays, 0 to 2 percent slopes	1,311	0.1
309A	Marvan complex, 0 to 2 percent slopes	5,551	0.3
311B	Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes	15,523	0.8

*See footnote at end of table

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
321A	Kobase clay loam, calcareous, 0 to 2 percent slopes	1,987	0.1
331B	Phillips-Elloam complex, 0 to 4 percent slopes	163,861	8.8
334B	Phillips-Kevin complex, 0 to 4 percent slopes	54,388	2.9
362C	Chinook-Yetull complex, 2 to 10 percent slopes	2,250	0.1
375B	Evanston-Lonna loams, 0 to 4 percent slopes	2,096	0.1
381A	Ethridge clay loam, 0 to 2 percent slopes	11,207	0.6
400F	Rubble land-Rock outcrop complex	546	*
402A	Gerdrum-Absher-Creed complex, 0 to 2 percent slopes	6,223	0.3
421C	Joplin-Hillon loams, 2 to 8 percent slopes	133,630	7.2
441C	Kevin-Hillon clay loams, 2 to 8 percent slopes	59,643	3.2
442C	Kevin-Elloam clay loams, 2 to 8 percent slopes	15,180	0.8
501B	Telstad-Hillon loams, 0 to 4 percent slopes	31,407	1.7
503B	Telstad-Joplin loams, 0 to 4 percent slopes	402,831	21.6
503C	Telstad-Joplin loams, 4 to 8 percent slopes	8,706	0.5
522A	Elloam-Absher complex, 0 to 2 percent slopes	2,738	0.2
530F	Warwood loam, 15 to 45 percent slopes	4,086	0.2
561B	Scobey-Kevin clay loams, 0 to 4 percent slopes	236,837	12.7
561C	Scobey-Kevin clay loams, 4 to 8 percent slopes	6,356	0.3
564B	Scobey-Hillon clay loams, 0 to 4 percent slopes	6,986	0.4
571D	Chinook-Cozberg-Yetull fine sandy loams, 4 to 15 percent slopes	4,379	0.2
573B	Cozberg-Chinook fine sandy loams, 0 to 4 percent slopes	4,778	0.3
603A	Havre-Harlake clay loams, 0 to 2 percent slopes	15,035	0.8
604A	Havre-Glendive complex, 0 to 2 percent slopes	6,030	0.3
611B	Hingham-Lonna loams, 0 to 4 percent slopes	6,981	0.4
661C	Twilight-Blacksheep fine sandy loams, 2 to 8 percent slopes	2,894	0.2
671B	Bearpaw-Vida clay loams, 0 to 4 percent slopes	20,006	1.1
671C	Bearpaw-Vida clay loams, 4 to 8 percent slopes	17,866	1.0
671D	Bearpaw-Vida clay loams, 8 to 15 percent slopes	5,214	0.3
674B	Bearpaw-Waltham clay loams, 0 to 4 percent slopes	953	0.1
696C	Vida-Zahill-Bearpaw clay loams, 2 to 8 percent slopes	9,143	0.5
701D	Yetull-Busby fine sandy loams, 4 to 15 percent slopes	1,964	0.1
721E	Zahill-Vida clay loams, 15 to 25 percent slopes	10,758	0.6
722D	Zahill-Vida clay loams, 8 to 15 percent slopes	4,925	0.3
725F	Zahill-Rock outcrop complex, 25 to 60 percent slopes	5,414	0.3
729F	Zahill-Obrien clay loams, 15 to 60 percent slopes	16,669	0.9
732C	Yetull-Lonesome loamy fine sands, 0 to 8 percent slopes	3,201	0.2
761D	Hedoes-Belain loams, 4 to 15 percent slopes	331	*
761F	Hedoes-Belain loams, 15 to 35 percent slopes	2,208	0.1
763E	Laceycreek loam, moist, 8 to 25 percent slopes	10,281	0.6
791C	Yamacall-Hillon loams, 2 to 8 percent slopes	1,738	0.1
795C	Yamacall-Benz clay loams, 2 to 8 percent slopes	4,671	0.3
799C	Yamacall clay loam, 2 to 8 percent slopes	2,413	0.1
801B	Williams-Vida loams, 0 to 4 percent slopes	1,220	*
801C	Williams-Vida loams, 4 to 8 percent slopes	3,176	0.2
812A	Glendive fine sandy loam, calcareous, 0 to 2 percent slopes	895	0.1
831A	Straw-Korchea loams, 0 to 2 percent slopes	1,525	0.1
832A	Nesda complex, 0 to 2 percent slopes	343	*
833A	Enbar-Straw-Eagleton loams, 0 to 2 percent slopes	4,812	0.3
842A	Bullhook-Nobe complex, 0 to 2 percent slopes	1,887	0.1
883F	Perma-Whitlash complex, 25 to 70 percent slopes	26,345	1.4
892F	Whitlash-Belain-Rock outcrop complex, 25 to 60 percent slopes	1,115	0.1
895F	Whitlash-Perma-Rock outcrop complex, 25 to 70 percent slopes	3,198	0.2
896F	Perma-Whitlash, cool-Rock outcrop complex, 25 to 70 percent slopes	13,327	0.7
899F	Zahill-Rock outcrop-Whitlash complex, 15 to 60 percent slopes	10,409	0.6
911F	Belain-Whitlash, moist-Hedoes complex, 15 to 60 percent slopes	8,808	0.5
915F	Belain-Whitlash-Hedoes complex, 15 to 45 percent slopes	9,635	0.5
951B	Kenilworth-Fortbenton fine sandy loams, 0 to 4 percent slopes	16,535	0.9
962B	Fortbenton loam, 0 to 4 percent slopes	29,324	1.6
965B	Fortbenton-Chinook fine sandy loams, 0 to 6 percent slopes	13,159	0.7
968C	Fortbenton-Hillon complex, 2 to 8 percent slopes	14,985	0.8
968D	Hillon-Fortbenton complex, 8 to 25 percent slopes	2,229	0.1

*See footnote at end of table

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
971F	Neldore-Bascovy silty clays, 25 to 60 percent slopes	2,412	0.1
974F	Neldore-Hillon complex, 25 to 70 percent slopes	4,340	0.2
DA	Denied access	3,840	0.2
M-W	Miscellaneous water	20	*
W	Water	10,562	0.6
	Total	1,866,600	100.0

* Less than 0.1 percent. The combined extent of the soils assigned an asterisk in the "Percent" column is about 1.1 percent of the county.

Soil Series and Detailed Map Units

In this section, arranged in alphabetical order, each soil series recognized in the county is described. Each description is followed by the detailed soil map units associated with the series.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the county is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (U.S. Dep. Agric., 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (U.S. Dep. Agric., 1975). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units on the detailed maps in Part III of this survey represent the soils or miscellaneous areas in the county. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given in Part II of this survey.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree

of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, saline is a phase of the Marvan series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Telstad-Joplin loams, 0 to 4 percent slopes is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Badland is an example.

The table "Acreage and Proportionate Extent of the Soils" in Parts I and II of the manuscript gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

A typical soil description with range in characteristics is included for each map unit in this section. Additional information specific to the map units, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

For general and detailed information about managing each map unit, see the following sections in Part II of this publication:

- "Range" section
- "Agronomy" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections
- "Forest Land" section

Absher Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Moderately well drained
Permeability: Very slow (0.06 inch/hour)
Landform: Till plains and stream terraces
Parent material: Glacial till and alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Absher clay, in an area of Gerdrum-Absher-Creed complex, 0 to 2 percent slopes, in rangeland; 900 feet south and 2,100 feet east of the northwest corner of sec. 16, T. 35 N., R. 10 E.

E—0 to 2 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; weak medium platy structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; common very fine pores; neutral; abrupt smooth boundary.

Btn—2 to 8 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; strong medium columnar structure parting to strong medium subangular blocky; very hard, very firm, very sticky and very plastic; common very fine roots; common very fine pores; common distinct clay films on faces of peds; mildly alkaline; clear wavy boundary.

Btknyz—8 to 12 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine pores; many distinct clay films on faces of peds; few fine masses of gypsum and other salts; slightly effervescent; moderately alkaline; clear wavy boundary.

Bknyz1—12 to 20 inches; light brownish gray (10YR 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; common very fine pores; few medium soft masses of lime; few fine masses of gypsum and other salts; strongly effervescent; moderately alkaline; clear wavy boundary.

Bknyz2—20 to 34 inches; light gray (2.5Y 7/2) clay, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; common very fine pores; common medium soft masses of lime; few fine soft masses of gypsum and other salts; strongly effervescent; moderately alkaline; clear wavy boundary.

Bknyz3—34 to 60 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; few very

fine roots; common very fine pores; common medium soft masses of lime; common medium soft masses of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F (60 to 68 degrees, summer)
Moisture control section: Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher
Depth to Bknyz horizon: 6 to 20 inches

E horizon
Hue—2.5Y, 10YR, or 7.5YR
Value—6 or 7 dry; 3, 4, or 5 moist
Chroma—1, 2, or 3
Clay content—40 to 55 percent
Electrical conductivity—4 to 8 mmhos/cm
Reaction—pH 6.6 to 8.4

Btn horizon
Hue—2.5Y, 7.5YR, or 10YR
Value—4, 5, or 6 dry; 4 or 5 moist
Chroma—1, 2, or 3
Texture—Silty clay, clay, or clay loam
Clay content—35 to 60 percent
Content of rock fragments—0 to 15 percent pebbles
Electrical conductivity—8 to 16 mmhos/cm
Sodium adsorption ratio—18 to 70
Reaction—pH 6.6 to 8.4

Btknyz horizon
Hue—2.5Y, 10YR, or 7.5YR
Value—4, 5, or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Clay loam, clay, or silty clay
Clay content—35 to 50 percent
Content of rock fragments—0 to 20 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—8 to 16 mmhos/cm
Sodium adsorption ratio—18 to 70
Gypsum—1 to 5 percent
Reaction—pH 7.9 to 9.6

Bknyz horizon
Hue—2.5Y, 10YR, or 7.5YR
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Clay loam, silty clay, clay, or silty clay loam
Clay content—35 to 50 percent
Content of rock fragments—0 to 20 percent pebbles
Calcium carbonate equivalent—4 to 15 percent
Electrical conductivity—16 to 30 mmhos/cm
Sodium adsorption ratio—23 to 70
Gypsum—1 to 5 percent
Reaction—pH 7.9 to 9.6

262A—Absher-Gerdrum complex, 0 to 2 percent slopes

Setting

Landform: Absher—till plains; Gerdrum—till plains
Position on landform: Absher—microlows; Gerdrum—microhighs
Slope: Absher—0 to 2 percent; Gerdrum—0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Absher and similar soils: 60 percent
Gerdrum and similar soils: 25 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Marvan and similar soils: 0 to 6 percent
Benz and similar soils: 0 to 5 percent
Soils that have slopes more than 2 percent: 0 to 3 percent

Major Component Description

Absher

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 4.0 inches

Gerdrum

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.0 inches

Ambrant Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid in the upper 0 to 33 inches (2.0 to 6.0 inches/hour); rapid below this depth (6.0 to 20.0 inches/hour)
Landform: Mountains
Parent material: Colluvium
Slope range: 25 to 60 percent
Annual precipitation: 17 to 20 inches
Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Coarse-loamy, mixed, frigid Typic Ustochrepts

Typical Pedon

Ambrant sandy loam, in an area of Winkler-Ambrant complex, 25 to 60 percent slopes, in woodland; 1,400 feet south and 600 feet west of the northeast corner of sec. 28, T. 28 N., R. 17 E.

Oi—2 inches to 0; forest litter of slightly decomposed needles, twigs, and leaves.

E1—0 to 6 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak very fine granular structure; soft, very friable, slightly sticky and nonplastic; common very fine roots; many very fine pores; slightly acid; clear wavy boundary.

E2—6 to 18 inches; pale brown (10YR 6/3) gravelly coarse sandy loam, dark brown (10YR 4/3) moist; weak very fine subangular blocky structure; loose, nonsticky and nonplastic; common very fine roots; 20 percent pebbles; neutral; clear wavy boundary.

E and Bt—18 to 33 inches; 80 percent light brownish gray (10YR 6/2) gravelly coarse sandy loam, dark grayish brown (10YR 4/2) moist (E part); 20 percent grayish brown (10YR 5/2) sandy loam lamellae, dark grayish brown (10YR 4/2) moist (Bt part); weak very fine granular structure; loose, nonsticky and nonplastic; common very fine roots; 20 percent pebbles; neutral; gradual wavy boundary.

2C—33 to 60 inches; light brownish gray (10YR 6/2) very gravelly loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; 35 percent pebbles; moderately acid.

Range in Characteristics

E1 horizon
Value—5, 6, or 7 dry; 3 or 4 moist
Chroma—2 or 3
Clay content—5 to 15 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, stones, or boulders, 0 to 10 percent angular pebbles
Reaction—pH 5.6 to 7.3

E2 horizon
Hue—10YR or 2.5Y
Value—6 or 7 dry; 4 or 5 moist
Chroma—1, 2, or 3
Texture—Coarse sandy loam or loamy coarse sand
Clay content—5 to 15 percent
Content of rock fragments—0 to 35 percent—0 to 10 percent cobbles, stones, or boulders, 5 to 35 percent angular pebbles
Reaction—pH 5.6 to 7.3

E and Bt horizons
Hue—E part—10YR or 2.5Y; Bt part—10YR or 2.5Y
Value—E part—6 or 7 dry, 4, 5, or 6 moist; B part— 4 or 5 dry, 3 or 4 moist
Chroma—E part—2 or 3; B part—2 or 3
Clay content, mixed—5 to 18 percent, lamellae has less than 3 percent clay increase
Texture—Sandy loam or coarse sandy loam
Content of rock fragments—0 to 35 percent—0 to 10 percent cobbles, 10 to 35 percent angular pebbles
Reaction—pH 5.6 to 7.3

2C horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—1, 2, 3, or 4
Texture—Coarse sandy loam, coarse sand, loamy coarse sand, sand, or loamy sand
Clay content—0 to 5 percent
Content of rock fragments—15 to 60 percent—10 to 25 percent cobbles and stones, 10 to 45 percent angular pebbles
Reaction—pH 5.6 to 7.3

Attewan Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate in the upper 0 to 27 inches (0.6 to 2.0 inches/hour); rapid below this depth (6.0 to 20.0 inches/hour)
Landform: Kames, eskers, and stream terraces
Parent material: Glacial outwash
Slope range: 0 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls

Typical Pedon

Attewan loam, 0 to 4 percent slopes, in an area of rangeland; 2,100 feet south and 200 feet east of the northwest corner of sec. 28, T. 32 N., R. 15 E.

A—0 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and plastic; common very fine roots; neutral; clear smooth boundary.

Bt1—6 to 11 inches; brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate very coarse prismatic structure parting to moderate coarse subangular blocky; hard, friable, sticky and plastic; common very fine roots; common very fine pores; many faint clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bt2—11 to 17 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 3/3) moist; weak very coarse prismatic structure parting to moderate coarse subangular blocky; hard, friable, sticky and plastic; common very fine roots; common very fine pores; common faint clay films on faces of peds; mildly alkaline; gradual wavy boundary.

Bk—17 to 27 inches; light gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; moderate medium and coarse subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; many very fine pores; many fine soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

2C1—27 to 31 inches; pale brown (10YR 6/3) very gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; 60 percent pebbles; lime coatings on underside of pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

2C2—31 to 37 inches; pale brown (10YR 6/3) very gravelly loamy sand, yellowish brown (10YR 5/4) moist; single grain; loose, nonsticky and nonplastic; 40 percent pebbles; lime coatings on underside of pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C3—37 to 60 inches; pale brown (10YR 6/3) very gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; 55 percent pebbles; lime coatings on underside of pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

A horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry; 2 or 3 moist
Chroma—2 or 3
Clay content—10 to 20 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent greater than 3-inch stones and cobbles, 0 to 10 percent less than 3-inch pebbles
Reaction—pH 6.1 to 7.3

Bt horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Clay loam, sandy clay loam, or loam
Clay content—20 to 35 percent
Content of rock fragments—0 to 25 percent—0 to 5 percent greater than 3-inch stones and cobbles, 0 to 20 percent less than 3-inch pebbles
Reaction—pH 6.6 to 7.8

Bk horizon
Hue—10YR or 2.5Y
Value—5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma—2, 3, 4, or 6
Texture—Loam, clay loam, silt loam, sandy clay loam, or sandy loam
Clay content—15 to 30 percent
Content of rock fragments—0 to 30 percent—0 to 5 percent stones and cobbles, 0 to 25 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.4 to 8.4

2C horizon
Hue—2.5Y or 10YR
Value—4, 5, or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Loamy sand, sand, loamy coarse sand, or coarse sand
Clay content—0 to 10 percent
Content of rock fragments—35 to 75 percent—0 to 15 percent stones and cobbles, 35 to 60 percent pebbles
Reaction—pH 7.4 to 8.4

27B—Attewan loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Attewan and similar soils: 85 percent

Minor Components

Tinsley and similar soils: 0 to 4 percent
Yetull and similar soils: 0 to 3 percent
Soils that have limy surface layers: 0 to 5 percent
Soils that have slopes more than 4 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 5.0 inches

272C—Attewan-Tinsley complex, 2 to 8 percent slopes

Setting

Landform: Attewan—kames and eskers; Tinsley—kames and eskers
Position on landform: Attewan—back slopes and foot slopes; Tinsley—shoulders
Slope: Attewan—2 to 8 percent; Tinsley—2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Attewan and similar soils: 60 percent
Tinsley and similar soils: 25 percent

Minor Components

Yetull and similar soils: 0 to 3 percent
Tinsley, extremely gravelly: 0 to 5 percent
Soils that have slopes more than 8 percent: 0 to 7 percent

Major Component Description

Attewan

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 5.0 inches

Tinsley

Surface layer texture: Gravelly sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 1.5 inches

200F—Badland

Setting

Landform: Hills
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Badland: 85 percent

Minor Components

Cabbart and similar soils: 0 to 8 percent
Havre and similar soils: 0 to 2 percent

Benz and similar soils: 0 to 2 percent
Nobe and similar soils: 0 to 3 percent

Major Component Description

Definition: Steep or very steep, barren land dissected by many intermittent drainage channels
Dominant parent material: Semiconsolidated sedimentary beds
Flooding: None

Bascovy Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Very slow (0.06 inch/hour)
Landform: Hills
Parent material: Semiconsolidated shale
Slope range: 2 to 60 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic, frigid Leptic Udic Haplusterts

Typical Pedon

Bascovy silty clay, in an area of Neldore-Bascovy silty clays, 25 to 60 percent slopes, in rangeland; 1,200 feet north and 1,250 feet east of the southwest corner of sec. 6, T. 34 N., R. 16 E.

A1—0 to 1 inch; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; strong very fine granular structure; slightly hard, firm, very sticky and very plastic; few very fine and fine roots; few very fine pores; neutral; abrupt smooth boundary.
A2—1 to 5 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine and fine roots; common very fine pores; neutral; clear smooth boundary.
Bw—5 to 11 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, very firm, very sticky and very plastic; few very fine and fine roots; few very fine pores; slightly acid; clear wavy boundary.
Bssy—11 to 15 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; extremely hard, very firm, very sticky and very plastic; few very fine and fine roots; few very fine pores; few slickensides intersecting at 40 degrees from horizontal; common fine masses and threads of gypsum; slightly acid; clear wavy boundary.
BC—15 to 26 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak fine and medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine roots; few very fine pores; strongly acid; gradual wavy boundary.
Cr—26 to 60 inches; gray (N 6/0) semiconsolidated shale, very dark grayish brown (2.5Y 3/2) moist; few fine masses of gypsum; strongly acid.

Range in Characteristics

Depth to Cr horizon: 20 to 40 inches

A horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 3, 4, or 5 moist
Chroma—1, 2, or 3
Texture—Clay or silty clay
Clay content—40 to 60 percent
Electrical conductivity—0 to 4 mmhos/cm
Reaction—pH 6.6 to 8.4

Bw horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—1, 2, or 3
Texture—Clay or silty clay
Clay content—40 to 60 percent
Electrical conductivity—0 to 4 mmhos/cm
Reaction—pH 6.1 to 8.4

Bssy horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—1, 2, or 3
Texture—Clay or silty clay
Clay content—40 to 60 percent
Gypsum—1 to 5 percent
Electrical conductivity—0 to 4 mmhos/cm
Reaction—pH 6.1 to 8.4

BC horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—1 or 2
Texture—Clay or silty clay
Clay content—40 to 60
Electrical conductivity—0 to 8 mmhos/cm
Reaction—pH 5.1 to 8.4

251D—Bascovy-Neldore clays, 2 to 15 percent slopes

Setting

Landform: Bascovy—hills; Neldore—hills
Position on landform: Bascovy—back slopes and foot slopes; Neldore—shoulders
Slope: Bascovy—2 to 15 percent; Neldore—2 to 15 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Bascovy and similar soils: 55 percent
Neldore and similar soils: 30 percent

Minor Components

Marvan and similar soils: 0 to 3 percent
Marvan, saline soils: 0 to 3 percent
Weingart and similar soils: 0 to 3 percent
Soils that have slopes more than 15 percent: 0 to 4 percent
Very shallow soils: 0 to 1 percent
Areas of rock outcrop: 0 to 1 percent

Major Component Description

Bascovy

Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 4.0 inches

Neldore

Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 2.3 inches

Bearpaw Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains and hills
Parent material: Glacial till
Slope range: 0 to 15 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine, montmorillonitic Typic Argiborolls

Typical Pedon

Bearpaw clay loam, in an area of Bearpaw-Vida clay loams, 0 to 4 percent slopes, in cropland; 2,400 feet north and 2,200 feet west of the southeast corner of sec. 21, T. 30 N., R. 15 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong very fine granular structure; hard, firm, sticky and plastic; many very fine roots; many very fine pores; neutral; abrupt smooth boundary.

Bt—5 to 13 inches; brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; moderate fine and medium prismatic structure parting to strong fine and medium subangular blocky; very hard, extremely firm, very sticky and very plastic; many very fine roots; many very fine pores; many distinct clay films on faces of peds; neutral; clear smooth boundary.

Bk1—13 to 21 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; many very fine roots; many very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—21 to 41 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium subangular blocky structure; very hard, firm, very sticky and plastic; few very fine roots; many very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—41 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; many very fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Ap horizon
Value—3, 4, or 5 dry; 2 or 3 moist
Chroma—2 or 3
Clay content—27 to 35 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Reaction—pH 6.1 to 7.8

Bt horizon
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Clay loam or clay
Clay content—35 to 50 percent
Content of rock fragments—0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles
Reaction—pH 6.6 to 7.8

Bk horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Clay loam, silty clay loam, or clay
Clay content—30 to 45 percent
Content of rock fragments—0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.4 to 8.4

671B—Bearpaw-Vida clay loams, 0 to 4 percent slopes

Setting

Landform: Bearpaw—till plains; Vida—till plains
Position on landform: Bearpaw—foot slopes; Vida—back slopes
Slope: Bearpaw—0 to 4 percent; Vida—0 to 4 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Bearpaw and similar soils: 60 percent
Vida and similar soils: 25 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Zahill and similar soils: 0 to 8 percent
Obrien and similar soils: 0 to 2 percent
Bearpaw clay: 0 to 1 percent
Soils that have slopes more than 4 percent: 0 to 3 percent

Major Component Description

Bearpaw

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.3 inches

Vida

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 8.1 inches

671C—Bearpaw-Vida clay loams, 4 to 8 percent slopes

Setting

Landform: Bearpaw—till plains; Vida—till plains
Position on landform: Bearpaw—foot slopes; Vida—back slopes (fig. 2)
Slope: Bearpaw—4 to 8 percent; Vida—4 to 8 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Bearpaw and similar soils: 55 percent
Vida and similar soils: 30 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Zahill and similar soils: 0 to 8 percent
Bearpaw clay: 0 to 1 percent
Soils that have slopes less than 4 percent: 0 to 1 percent
Obrien and similar soils: 0 to 1 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Bearpaw

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till

Figure 2.—Map unit 671C, Bearpaw-Vida clay loams, 4 to 8 percent slopes in the foreground. Map unit 191F, Winkler-Ambrant complex, 25 to 60 percent slopes in the background with forest land native plant cover type.

Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.3 inches

Vida

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 8.1 inches

671D—Bearpaw-Vida clay loams, 8 to 15 percent slopes

Setting

Landform: Bearpaw—hills; Vida—hills
Position on landform: Bearpaw—back slopes; Vida—shoulders
Slope: Bearpaw—8 to 15 percent; Vida—8 to 15 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Bearpaw and similar soils: 50 percent
Vida and similar soils: 35 percent

Minor Components

Zahill and similar soils: 0 to 8 percent
Bearpaw clay: 0 to 1 percent
Vida loam: 0 to 1 percent
Obrien and similar soils: 0 to 1 percent
Soils that have slopes more than 15 percent: 0 to 1 percent

Soils that have slopes less than 8 percent: 0 to 3 percent

Major Component Description

Bearpaw

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.3 inches

Vida

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 8.1 inches

674B—Bearpaw-Waltham clay loams, 0 to 4 percent slopes

Setting

Landform: Bearpaw—till plains; Waltham—till plains
Position on landform: Bearpaw—microhighs; Waltham—microlows
Slope: Bearpaw—0 to 4 percent; Waltham—0 to 4 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Bearpaw and similar soils: 65 percent
Waltham and similar soils: 20 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Bearpaw clay: 0 to 6 percent
Soils that have slopes more than 4 percent: 0 to 8 percent

Major Component Description

Bearpaw

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.3 inches

Waltham

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 7.8 inches

Beaverton Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate in the upper 0 to 16 inches (0.6 to 2.0 inches/hour); rapid below this depth (6.0 to 20.0 inches/hour)
Landform: Kames and eskers
Parent material: Glacial outwash
Slope range: 4 to 15 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal over sandy or sandy-skeletal, mixed Typic Argiborolls

Typical Pedon

Beaverton gravelly loam, 4 to 15 percent slopes, in an area of cropland; 1,600 feet south and 2,400 feet east of the southwest corner of sec. 35, T. 31 N., R. 16 E.

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; hard, very friable, sticky and plastic; many very fine roots; common very fine pores; 5 percent cobbles, 15 percent pebbles; neutral; abrupt smooth boundary.
Bt1—4 to 13 inches; brown (10YR 4/3) very gravelly clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; many very fine roots; common very fine pores; many faint clay films on faces of peds; 15 percent cobbles, 25 percent pebbles; neutral; clear wavy boundary.

Bt2—13 to 16 inches; brown (10YR 5/3) very gravelly sandy clay loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; very hard, friable, sticky and plastic; common very fine roots; common very fine pores; common faint clay films on faces of peds; 20 percent cobbles, 25 percent pebbles; neutral; clear wavy boundary.

2Bk1—16 to 23 inches; grayish brown (10YR 5/2) very gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; 25 percent cobbles, 30 percent pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

2Bk2—23 to 60 inches; light brownish gray (10YR 6/2) very gravelly sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; 25 percent cobbles, 30 percent pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Ap horizon
Hue—2.5Y, 10YR, or 7.5YR
Value—4 or 5 dry; 2 or 3 moist
Chroma—2 or 3
Clay content—15 to 27 percent
Content of rock fragments—5 to 35 percent—
0 to 5 percent stones, 0 to 5 percent cobbles, 5 to 25 percent pebbles
Reaction—pH 6.6 to 7.8

Bt horizon
Hue—2.5Y, 10YR, or 7.5YR
Value—4 or 5 dry; 2, 3, or 4 moist
Chroma—2 or 3
Texture—Clay loam or sandy clay loam
Clay content—25 to 35 percent
Content of rock fragments—35 to 60 percent—
0 to 5 percent stones, 0 to 30 percent cobbles, 15 to 45 percent pebbles
Reaction—pH 6.6 to 7.8

2Bk1 horizon
Hue—2.5Y, 10YR, or 7.5YR
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loamy sand or sand
Clay content—0 to 10 percent
Content of rock fragments—35 to 80 percent—
0 to 10 percent stones, 0 to 35 percent cobbles, 15 to 60 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.4 to 8.4

2Bk2 horizon
Hue—2.5Y, 10YR, or 7.5YR
Value—5 or 6 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loamy sand or sand
Clay content—0 to 10 percent
Content of rock fragments—35 to 80 percent—
0 to 5 percent stones, 0 to 35 percent cobbles, 15 to 65 percent pebbles
Calcium carbonate equivalent—3 to 12 percent
Reaction—pH 7.4 to 8.4

53D—Beaverton gravelly loam, 4 to 15 percent slopes

Setting

Landform: Kames and eskers
Slope: 4 to 15 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Beaverton and similar soils: 85 percent

Minor Components

Beaverton loam soils: 0 to 5 percent
Tinsley and similar soils: 0 to 7 percent
Soils that have slopes more than 15 percent: 0 to 2 percent
Soils that have slopes less than 4 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.2 inches

Belain Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Hills
Parent material: Igneous rock
Slope range: 4 to 60 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 100 days

Taxonomic Class: Coarse-loamy, mixed Typic Haploborolls

Typical Pedon

Belain loam, in an area of Hedoes-Belain loams, 4 to 15 percent slopes, in an area of rangeland; 300 feet south and 1,200 feet west of the northeast corner of sec. 6, T. 30 N., R. 16 E.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and plastic; many very fine roots; common very fine pores; slightly acid; clear smooth boundary.

Bw1—3 to 12 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and plastic; many very fine roots; common very fine pores; slightly acid; clear wavy boundary.

Bw2—12 to 18 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine roots; 25 percent pebbles; neutral; clear wavy boundary.

Bk1—18 to 27 inches; grayish brown (2.5Y 5/2) gravelly sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, loose, nonsticky and nonplastic; few very fine roots; 30 percent pebbles; common distinct lime coatings on pebbles; neutral; clear wavy boundary.

Bk1—27 to 32 inches; grayish brown (2.5Y 5/2) very gravelly sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, loose, nonsticky and nonplastic; few very fine roots; 45 percent pebbles; common distinct lime coatings on pebbles; neutral; abrupt wavy boundary.

R—32 inches; igneous rock.

Range in Characteristics

Depth to bedrock: 20 to 40 inches

A horizon
Hue—7.5YR, 10YR, or 2.5Y
Value—4 or 5 dry; 2 or 3 moist
Chroma—2 or 3
Clay content—15 to 20 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Reaction—pH 6.1 to 7.8

Bw horizon
Hue—7.5YR, 10YR, or 2.5Y
Value—4, 5, or 6 dry; 3, 4, or 5 moist
Chroma—2, 3, or 4
Clay content—10 to 18 percent
Texture—Sandy loam or loam
Content of rock fragments—0 to 35 percent—0 to 5 percent cobbles, 0 to 35 percent pebbles
Reaction—pH 6.6 to 8.4

Bk horizon
Hue—7.5YR, 10YR, or 2.5Y
Value—4, 5, or 6 dry; 3, 4, or 5 moist
Clay content—10 to 18 percent
Chroma—2, 3, or 4
Texture—Loam or sandy loam
Content of rock fragments—15 to 45 percent—0 to 5 percent cobbles, 15 to 40 percent pebbles
Lime coats or casts—Few to common or faint to prominent
Calcium carbonate equivalent—1 to 10 percent
Reaction—pH 7.4 to 8.4

911F—Belain-Whitlash, moist-Hedoes complex, 15 to 60 percent slopes

Setting

Landform: Belain—hills; Whitlash—hills; Hedoes—hills
Position on landform: Belain—back slopes; Whitlash—shoulders; Hedoes—foot slopes
Slope: Belain—25 to 60 percent; Whitlash—25 to 60 percent; Hedoes—15 to 35 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Belain and similar soils: 35 percent
Whitlash and similar soils: 30 percent
Hedoes and similar soils: 20 percent

Minor Components

Laceycreek and similar soils: 0 to 3 percent

Perma and similar soils: 0 to 4 percent
Soils that have slopes more than 60 percent: 0 to 3 percent
Soils that have slopes less than 15 percent: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Belain

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.5 inches

Whitlash

Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Forest land
Flooding: None
Available water capacity: About 1.7 inches

Hedoes

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 7.1 inches

915F—Belain-Whitlash-Hedoes complex, 15 to 45 percent slopes

Setting

Landform: Belain—hills; Whitlash—hills; Hedoes—hills
Position on landform: Belain—back slopes; Whitlash—shoulders; Hedoes—foot slopes
Slope: Belain—25 to 45 percent; Whitlash—25 to 45 percent; Hedoes—15 to 35 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Belain and similar soils: 35 percent
Whitlash and similar soils: 30 percent
Hedoes and similar soils: 20 percent

Minor Components

Whitlash, cool soils: 0 to 5 percent
Laceycreek and similar soils: 0 to 3 percent
Perma and similar soils: 0 to 2 percent
Soils that have slopes more than 45 percent: 0 to 2 percent
Soils that have slopes less than 15 percent: 0 to 2 percent
Areas of rock outcrop: 0 to 1 percent

Major Component Description

Belain

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.5 inches

Whitlash

Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 1.7 inches

Hedoes

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 7.1 inches

Benz Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans or stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents

Typical Pedon

Benz clay loam, in an area of Yamacall-Benz clay loams, 2 to 8 percent slopes, in rangeland; 1,000 feet south and 2,400 feet east of the northwest corner of sec. 27, T. 29 N., R. 8 E.

A—0 to 2 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure; hard, friable, sticky and plastic; common very fine roots; many very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bn—2 to 12 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, friable, sticky and plastic; common very fine roots; many very fine pores; slightly effervescent; strongly alkaline; clear wavy boundary.

Bkn—12 to 26 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; common very fine pores; few fine soft masses of lime; strongly effervescent; strongly alkaline; clear wavy boundary.

Bknyz1—26 to 52 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, firm, very sticky and plastic; few very fine roots; few very fine pores; few fine soft masses of lime; common fine seams of gypsum and other salts; strongly effervescent; very strongly alkaline; gradual wavy boundary.

Bknyz2—52 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine pores; few fine soft masses of lime; few fine masses of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Content of clay in the control section: 18 to 35 percent

A horizon
Hue—2.5Y or 10YR
Value—5, 6, or 7 dry; 3, 4, or 5 moist
Chroma—2 or 3
Clay content—27 to 35 percent
Electrical conductivity—4 to 8 mmhos/cm
Sodium adsorption ratio—4 to 13
Reaction—pH 7.4 to 9.0

B horizon
Hue—5Y, 2.5Y, or 10YR
Value—5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma—2 or 3
Texture—Loam, clay loam, silt loam, or fine sandy loam
Clay content—18 to 35 percent
Electrical conductivity—8 to 16 mmhos/cm
Sodium adsorption ratio—13 to 30
Calcium carbonate equivalent—5 to 15 percent
Gypsum—2 to 5 percent
Reaction—pH 8.5 to 9.6

55A—Benz clay loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Benz and similar soils: 85 percent

Minor Components

Thibadeau and similar soils: 0 to 1 percent
Gerdrum and similar soils: 0 to 5 percent
Yetull and similar soils: 0 to 2 percent
Yamacall and similar soils: 0 to 3 percent
Nobe and similar soils: 0 to 1 percent
Benz loam: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.4 inches

Blacksheep Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains
Parent material: Semiconsolidated, sandy sedimentary beds
Slope range: 2 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents

Typical Pedon

Blacksheep fine sandy loam, in an area of Twilight-Blacksheep fine sandy loams, 2 to 8 percent slopes, in rangeland; 700 feet south and 2,400 feet east of the northwest corner of sec. 5, T. 32 N., R. 11 E.

A—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—6 to 12 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine pores; few fine masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—12 to 17 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine pores; few fine masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Cr—17 to 60 inches; pale brown (10YR 6/3) semiconsolidated sandstone, dark brown (10YR 4/3) moist; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 44 to 47 degrees F
Moisture control section: Between 8 inches and the paralithic contact; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 5 degrees F or higher
Depth to Cr horizon: 10 to 20 inches

A horizon
Hue—2.5Y, 7.5YR, or 10YR
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2 or 3
Clay content—5 to 15 percent
Reaction—pH 7.4 to 8.4

Bk horizon
Hue—2.5Y, 7.5YR, or 10YR
Value—5, 6, or 7 dry; 5 or 6 moist
Chroma—2 or 3
Texture—Very fine sandy loam, fine sandy loam, sandy loam, or loamy fine sand
Clay content—5 to 15 percent
Calcium carbonate equivalent—5 to 10 percent
Reaction—pH 7.9 to 8.4

Bowery Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 0 to 15 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 100 days

Taxonomic Class: Fine-loamy, mixed Pachic Haploborolls

Typical Pedon

Bowery loam, 8 to 15 percent slopes, in an area of rangeland; 300 feet south and 2,500 feet east of the northwest corner of sec. 25, T. 30 N., R. 16 E.

A1—0 to 7 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak very fine granular structure; soft, very friable, sticky and plastic; many very fine roots, many very fine pores; 5 percent pebbles; slightly acid; clear smooth boundary.

A2—7 to 24 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots, common very fine pores; slightly acid; clear wavy boundary.

Bw1—24 to 44 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots, common very fine pores; neutral; gradual wavy boundary.

Bw2—44 to 60 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 4/3) moist; weak very fine subangular blocky structure; soft, very friable, sticky and slightly plastic; few very fine roots, common very fine pores; 5 percent cobbles, 15 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 42 to 45 degrees F
Moisture control section: Between 4 and 12 inches
Mollic epipedon thickness: 16 to 37 inches
Depth to lime: Deeper than 60 inches

A horizon
Hue—10YR or 2.5Y
Value—3 or 4 dry
Chroma—2 or 3
Clay content—18 to 27 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.1 to 7.3

Bw1 horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry; 3 or 4 moist
Chroma—2, 3, or 4
Clay content—18 to 27 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.1 to 7.3

Bw2 horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry
Chroma—2, 3, or 4
Texture—Loam or fine sandy loam
Clay content—10 to 27 percent
Content of rock fragments—10 to 25 percent—10 to 20 percent pebbles, 0 to 5 percent cobbles
Bulk density—1.4 to 1.55
Reaction—pH 6.1 to 7.3

76B—Bowery loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 4 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Bowery and similar soils: 85 percent

Minor Components

Hedoes fine sandy loam: 0 to 6 percent
Farnuf and similar soils: 0 to 5 percent
Soils that have slopes more than 4 percent: 0 to 4 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.6 inches

76C—Bowery loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 8 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Bowery and similar soils: 85 percent

Minor Components

Hedoes fine sandy loam: 0 to 5 percent
Farnuf and similar soils: 0 to 5 percent
Soils that have slopes less than 4 percent: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.6 inches

76D—Bowery loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Bowery and similar soils: 85 percent

Minor Components

Belain and similar soils: 0 to 5 percent
Hedoes fine sandy loam: 0 to 3 percent
Farnuf and similar soils: 0 to 2 percent
Soils that have slopes more than 15 percent: 0 to 3 percent
Soils that have slopes less than 8 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.6 inches

Bullhook Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Bullhook clay loam, 0 to 2 percent slopes, in an area of rangeland; 1,300 feet south and 50 feet east of the northwest corner of sec. 2, T. 35 N., R. 12 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak very fine granular structure; hard, firm, sticky and plastic; common very fine roots; common very fine pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C—3 to 8 inches; grayish brown (2.5Y 5/2) clay loam consisting of thin strata of loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, sticky and plastic; common very fine roots; common very fine pores; strongly effervescent; very strongly alkaline; clear wavy boundary.

Cyz—8 to 60 inches; grayish brown (2.5Y 5/2) clay loam consisting of thin strata of loam or fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, sticky and plastic; common very fine roots; common very fine pores; common fine small masses and seams of gypsum and other salts; strongly effervescent; very strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or above

A horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2, 3, or 4
Clay content—27 to 40 percent
Electrical conductivity—2 to 8 mmhos/cm
Sodium adsorption ratio—8 to 13
Calcium carbonate equivalent—5 to 10 percent
Reaction—pH 7.4 to 9.4

C horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay loam, loam, or silty clay loam with

or without thin layers of loam, clay, silty clay loam, fine sandy loam, or silt loam
Clay content—18 to 35 percent
Electrical conductivity—4 to 16 mmhos/cm
Sodium adsorption ratio—13 to 20
Calcium carbonate equivalent—5 to 10
Reaction—pH 7.4 to 9.6

Cyz horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay loam, loam, or silty clay loam with or without thin layers of fine sandy loam, loam, clay loam, silty clay loam, or silt loam
Clay content—18 to 35 percent
Electrical conductivity—8 to 16 mmhos/cm
Sodium adsorption ratio—13 to 30
Gypsum—2 to 5 percent
Calcium carbonate equivalent—5 to 10 percent
Reaction—pH 7.9 to 9.6
Other features—Gypsum and other salts are inherent in the parent material

84A—Bullhook clay loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Bullhook and similar soils: 85 percent

Minor Components

Thibadeau and similar soils: 0 to 1 percent
Nobe and similar soils: 0 to 4 percent
Havre and similar soils: 0 to 4 percent
Bullhook, occasionally flooded: 0 to 2 percent
Hanly and similar soils: 0 to 4 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 8.5 inches

842A—Bullhook-Nobe complex, 0 to 2 percent slopes

Setting

Landform: Bullhook—flood plains; Nobe—flood plains
Slope: Bullhook—0 to 2 percent; Nobe—0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Bullhook and similar soils: 45 percent
Nobe and similar soils: 40 percent

Minor Components

Somewhat poorly drained soils: 0 to 2 percent
Havre and similar soils: 0 to 7 percent
Soils that have slopes more than 2 percent: 0 to 6 percent

Major Component Description

Bullhook

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 8.5 inches

Nobe

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 4.1 inches

Busby Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills
Parent material: Alluvium and eolian deposits
Slope range: 4 to 15 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-loamy, mixed, frigid Aridic Ustochrepts

Typical Pedon

Busby fine sandy loam, in an area of Yetull-Busby fine sandy loams, 4 to 15 percent slopes, in cropland; 300 feet north and 2,500 feet west of the southeast corner of sec. 34, T. 36 N., R. 10 E.

Ap—0 to 4 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.
Bw—4 to 14 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; violently effervescent; moderately alkaline; clear wavy boundary.
Bk1—14 to 29 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine angular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.
Bk2—29 to 41 inches; light gray (2.5Y 7/2) fine sandy loam, light brownish gray (2.5Y 6/2) moist; weak very fine and fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.
BC—41 to 60 inches; light gray (2.5Y 7/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; single grain; soft, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 8 and 24 inches; dry in all parts between four-tenths and five-tenths of the cumulative days when the soil temperature at 20 inches is 41 degrees F or above
Depth to Bk horizon: 10 to 20 inches

A horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 3 or 4 moist
Chroma—2, 3, or 4
Clay content—10 to 18 percent
Reaction—pH 7.4 to 8.4

Bw horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Fine sandy loam, sandy loam, or loam
Clay content—10 to 18 percent
Reaction—pH 7.4 to 8.4

Bk horizon
Hue—10YR, 2.5Y, or 5Y
Value—6 or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Fine sandy loam or sandy loam
Clay content—10 to 18 percent
Effervescence—Strong to violent
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.4 to 8.4

C horizon
Hue—10YR or 2.5Y
Value—6 or 7 dry; 5 or 6 moist
Chroma—2, 3, or 4
Texture—Fine sandy loam, sandy loam, loamy fine sand, loamy sand, or fine sand (The loamy fine sand, loamy sand, or fine sand textures are below depths of 40 inches)
Clay content—3 to 18 percent
Reaction—pH 7.9 to 8.4

Cabba Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Hills
Parent material: Semiconsolidated sedimentary beds
Slope range: 15 to 60 percent
Annual precipitation: 13 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 70 to 110 days

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents

Typical Pedon

Cabba loam, in an area of Cabba-Macar loams, 15 to 60 percent slopes, in rangeland; 2,200 feet south and 1,350 feet east of the northwest corner of sec. 31, T. 29 N., R. 15 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.
Bk1—3 to 8 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.
Bk2—8 to 15 inches; light gray (10YR 7/2) loam, olive (5Y 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine pores; many fine soft masses of lime; violently effervescent; moderately alkaline; abrupt wavy boundary.
Cr—15 to 60 inches; light gray (10YR 7/2) semiconsolidated sedimentary bedrock, olive (5Y 5/3) moist; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches or to the paralithic contact; frozen November through March, dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees or higher
Depth to Cr horizon: 10 to 20 inches
Other features: The chromas of 1 are lithochromic

A horizon
Hue—10YR or 2.5Y
Value—3, 4, 5, or 6 dry; 3 or 4 moist
Chroma—1, 2, 3, or 4
Clay content—10 to 27 percent
Electrical conductivity—0 to 4 mmhos/cm
Effervescence—None to violent
Calcium carbonate equivalent—5 to 10 percent
Reaction—pH 7.4 to 9.0

Bk horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, 7, or 8 dry; 4, 5, 6, or 7 moist
Chroma—1, 2, 3, 4, or 6
Texture—Loam, silt loam, clay loam, or silty clay loam
Clay content—20 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 8 mmhos/cm
Reaction—pH 7.4 to 9.0

Cr horizon
Reaction—pH 7.4 to 8.4
Other features—This horizon consists of interbedded layers of silt, sand, and clay, or a mixture of the three. They crush to loam, silt loam, very fine sandy loam, clay loam, or silty clay loam. Some layers are harder than others, but all are considered rippable or soft and are readily dug with power tools.

205F—Cabba-Macar loams, 15 to 60 percent slopes

Setting

Landform: Cabba—hills; Macar—hills
Position on landform: Cabba—shoulders; Macar—back slopes
Slope: Cabba—15 to 60 percent; Macar—15 to 60 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Cabba and similar soils: 50 percent
Macar and similar soils: 35 percent

Minor Components

Farnuf and similar soils: 0 to 3 percent

Tally and similar soils: 0 to 5 percent
Soils more than 20 inches deep: 0 to 4 percent
Soils that have slopes less than 15 percent: 0 to 3 percent

Major Component Description

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 2.5 inches

Macar

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.3 inches

203F—Cabba-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform: Cabba—hills; Rock outcrop—hills
Position on landform: Cabba—shoulders; Rock outcrop—back slopes (fig. 3)
Slope: 25 to 60 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

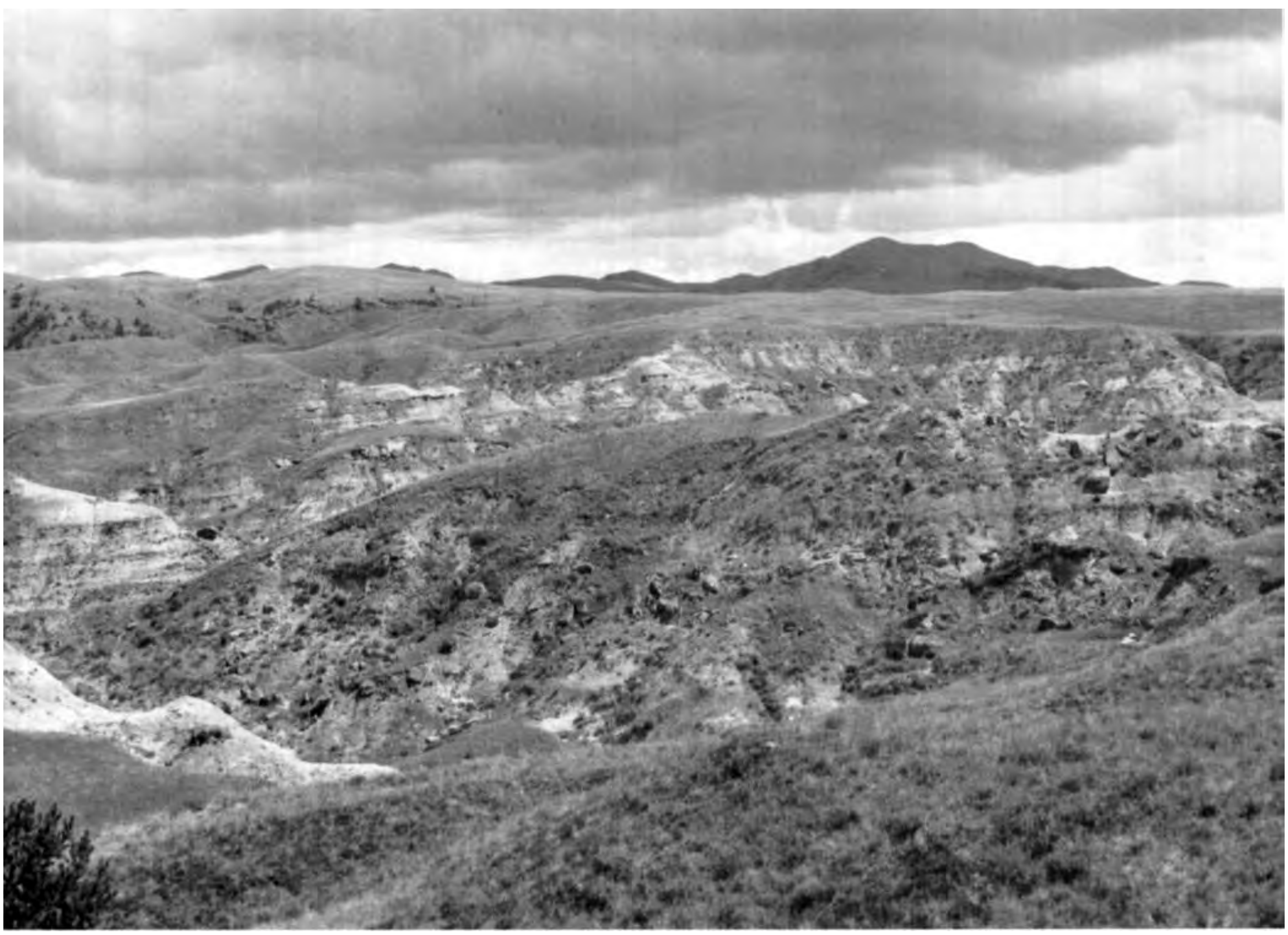

Figure 3.—Map unit 203F, Cabba-Rock outcrop complex, 25 to 60 percent slopes.

Composition

Major Components

Cabba and similar soils: 45 percent
Rock outcrop: 40 percent

Minor Components

Tally and similar soils: 0 to 1 percent
Korchea and similar soils: 0 to 1 percent
Macar and similar soils: 0 to 5 percent
Soils that have slopes less than 25 percent: 0 to 4 percent
Soils that have slopes more than 60 percent: 0 to 1 percent
Very shallow soils: 0 to 3 percent

Major Component Description

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 2.5 inches

Rock outcrop

Definition: Exposures of siltstone bedrock
Flooding: None

204F—Cabba-Zahill complex, 25 to 60 percent slopes

Setting

Landform: Cabba—hills; Zahill—hills
Position on landform: Cabba—back slopes; Zahill—shoulders
Slope: Cabba—25 to 60 percent; Zahill—25 to 60 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Cabba and similar soils: 45 percent
Zahill and similar soils: 40 percent

Minor Components

Korchea and similar soils: 0 to 1 percent
Tally and similar soils: 0 to 5 percent
Macar and similar soils: 0 to 3 percent
Soils that have slopes less than 25 percent: 0 to 4 percent
Soils that have slopes more than 60 percent: 0 to 1 percent
Areas of rock outcrop: 0 to 1 percent

Major Component Description

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 2.5 inches

Zahill

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Cabbart Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Hills and sedimentary plains
Parent material: Semiconsolidated sedimentary beds
Slope range: 2 to 60 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents

Typical Pedon

Cabbart loam, in an area of Delpoint-Cabbart loams, 2 to 8 percent slopes, in cropland; 2,100 feet south and 2,100 feet east of the northwest corner of sec. 28, T. 31 N., R. 11 E.

Ap—0 to 6 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; weak fine and medium subangular blocky structure parting to

moderate very fine granular; soft, very friable, slightly sticky and slightly plastic; common very fine roots; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bk—6 to 15 inches; light gray (2.5Y 7/2) loam, light yellowish brown (2.5Y 6/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine roots; many very fine pores; many fine soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

BC—15 to 18 inches; pale yellow (2.5Y 7/4) loam, light yellowish brown (2.5Y 6/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine roots; common very fine pores; violently effervescent; strongly alkaline; gradual smooth boundary.

Cr—18 to 60 inches; light yellowish brown (2.5Y 6/4) semiconsolidated sedimentary beds, light brownish gray (2.5Y 6/2) moist; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 to 12 inches or to the paralithic contact; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is greater than 41 degrees F
Depth to Cr horizon: 10 to 20 inches

A horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 3, 4, or 5 moist
Chroma—2, 3, or 4
Clay content—18 to 27 percent
Electrical conductivity—0 to 4 mmhos/cm
Calcium carbonate equivalent—5 to 10 percent
Reaction—pH 7.4 to 9.0

Bk horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Clay content—18 to 27 percent
Structure—Massive, prismatic, or blocky
Content of rock fragments—0 to 45 percent—0 to 15 percent hard pebbles, 0 to 45 percent soft pebbles
Electrical conductivity—0 to 4 mmhos/cm
Sodium adsorption ratio—1 to 5
Calcium carbonate equivalent—15 to 25 percent
Reaction—pH 7.4 to 9.0

BC horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma—3 or 4
Texture—Loam, clay loam, silt loam, or silty clay loam
Clay content—18 to 35 percent
Content of rock fragments—0 to 45 percent—0 to 15 percent hard pebbles, 0 to 45 percent soft pebbles
Electrical conductivity—0 to 8 mmhos/cm
Sodium adsorption ratio—1 to 5
Gypsum—0 to 5 percent
Reaction—pH 7.4 to 9.0

212F—Cabbart-Hillon loams, 25 to 60 percent slopes

Setting

Landform: Cabbart—hills; Hillon—hills
Position on landform: Cabbart—back slopes; Hillon—shoulders
Slope: Cabbart—25 to 60 percent; Hillon—25 to 60 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Cabbart and similar soils: 45 percent
Hillon and similar soils: 40 percent

Minor Components

Blacksheep and similar soils: 0 to 3 percent
Yawdim and similar soils: 0 to 5 percent
Havre and similar soils: 0 to 1 percent
Soils that have slopes less than 25 percent: 0 to 4 percent
Soils that have slopes more than 60 percent: 0 to 1 percent
Areas of rock outcrop: 0 to 1 percent

Major Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.3 inches

Hillon

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.0 inches

211F—Cabbart-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform: Cabbart—hills; Rock outcrop—hills
Position on landform: Cabbart—shoulders; Rock outcrop—back slopes
Slope: 25 to 60 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Cabbart and similar soils: 45 percent
Rock outcrop: 40 percent

Minor Components

Blacksheep and similar soils: 0 to 2 percent
Yawdim and similar soils: 0 to 5 percent
Havre and similar soils: 0 to 1 percent
Delpoint and similar soils: 0 to 4 percent
Soils that have slopes more than 60 percent: 0 to 1 percent
Very shallow soils: 0 to 2 percent

Major Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.3 inches

Rock outcrop

Definition: Exposures of siltstone bedrock
Flooding: None

213E—Cabbart-Yawdim complex, 8 to 25 percent slopes

Setting

Landform: Cabbart—hills; Yawdim—hills
Position on landform: Cabbart—back slopes; Yawdim—back slopes
Slope: Cabbart—8 to 25 percent; Yawdim—8 to 25 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Cabbart and similar soils: 50 percent
Yawdim and similar soils: 35 percent

Minor Components

Blacksheep and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 5 percent
Very shallow soils: 0 to 1 percent
Soils that have slopes less than 8 percent: 0 to 1 percent
Soils that have slopes more than 25 percent: 0 to 4 percent
Areas of rock outcrop: 0 to 1 percent

Major Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.3 inches

Yawdim

Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland

Flooding: None
Available water capacity: About 2.5 inches

Chinook Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Till plains, alluvial fans, stream terraces, and hills
Parent material: Alluvium and eolian deposits
Slope range: 0 to 15 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-loamy, mixed Aridic Haploborolls

Typical Pedon

Chinook fine sandy loam, 2 to 8 percent slopes, in an area of rangeland; 1,300 feet north and 1,200 feet east of the southwest corner of sec. 27, T. 32 N., R. 15 E.

A—0 to 4 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; many very fine pores; neutral; clear smooth boundary.

Bw1—4 to 11 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; many fine roots; few very fine pores; mildly alkaline; gradual smooth boundary.

Bw2—11 to 21 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine prismatic structure parting to weak fine subangular blocky; slightly hard, very friable, nonsticky and nonplastic; few fine roots; few very fine pores; mildly alkaline; gradual smooth boundary.

Bk1—21 to 31 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few fine roots; few very fine pores; few fine threads of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—31 to 41 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few fine roots; few very fine pores; few fine threads of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

BC—41 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grain; loose; nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 8 to 24 inches
Mollic epipedon thickness: 7 to 15 inches thick
Depth to Bk horizon: 10 to 35 inches

A horizon
Hue—10YR or 2.5Y
Value—2 or 3 moist
Chroma—2 or 3
Clay content—5 to 18 percent
Content of rock fragments—0 to 35 percent pebbles
Reaction—pH 6.6 to 8.4

Bw horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 3, 4 or 5 moist
Chroma—2, 3, or 4
Texture—Fine sandy loam or sandy loam
Clay content—5 to 18 percent and more than 50 percent medium, fine, and coarser sand
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.6 to 8.4

Bk1 horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Fine sandy loam or sandy loam
Clay content—5 to 18 percent and more than 50 percent medium, fine, and coarser sand
Content of rock fragments—0 to 15 percent pebbles
Calcium carbonate equivalent—3 to 15 percent
Reaction—pH 6.6 to 9.0

Bk2 horizon
Hue—10YR, 2.5Y, or 5Y

Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Fine sandy loam or sandy loam
Clay content—5 to 18 percent and more than 50 percent medium, fine, and coarser sand
Content of rock fragments—0 to 15 percent pebbles
Calcium carbonate equivalent—5 to 15 percent—few and common masses and threads of lime
Reaction—pH 6.6 to 9.0

C horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—fine sandy loam, sandy loam, loamy fine sand, or loamy sand
Clay content—5 to 15 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 7.4 to 9.0

36A—Chinook fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Chinook and similar soils: 85 percent

Minor Components

Busby and similar soils: 0 to 4 percent
Kenilworth and similar soils: 0 to 4 percent
Soils that have loamy material below 40 inches: 0 to 4 percent
Soils that have slopes more than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Flooding: None
Available water capacity: About 7.8 inches

36C—Chinook fine sandy loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Chinook and similar soils: 85 percent

Minor Components

Yetull and similar soils: 0 to 2 percent
Busby and similar soils: 0 to 6 percent
Soils that have slopes more than 8 percent: 0 to 4 percent
Soils that have slopes less than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Flooding: None
Available water capacity: About 7.8 inches

571D—Chinook-Cozberg-Yetull fine sandy loams, 4 to 15 percent slopes

Setting

Landform: Chinook—hills; Cozberg—hills; Yetull—hills
Slope: Chinook—4 to 15 percent; Cozberg—4 to 15 percent; Yetull—4 to 15 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Chinook and similar soils: 35 percent
Cozberg and similar soils: 25 percent
Yetull and similar soils: 25 percent

Minor Components

Tinsley and similar soils: 0 to 3 percent
Evanston, calcareous soils: 0 to 3 percent
Busby and similar soils: 0 to 2 percent
Soils that have slopes less than 4 percent: 0 to 2 percent
Soils that have slopes more than 15 percent: 0 to 5 percent

Major Component Description

Chinook

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 7.8 inches

Cozberg

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 5.0 inches

Yetull

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 4.2 inches

362C—Chinook-Yetull complex, 2 to 10 percent slopes

Setting

Landform: Chinook—hills; Yetull—hills
Position on landform: Chinook—back slopes; Yetull—shoulders
Slope: Chinook—2 to 10 percent; Yetull—2 to 10 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Chinook and similar soils: 50 percent
Yetull and similar soils: 35 percent

Minor Components

Busby and similar soils: 0 to 7 percent
Cozberg and similar soils: 0 to 3 percent
Areas of duneland: 0 to 2 percent
Blowout areas: 0 to 3 percent

Major Component Description

Chinook

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian deposits
Flooding: None
Available water capacity: About 7.8 inches

Yetull

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.6 inches

Cozberg Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid in the upper 0 to 24 inches (2.0 to 6.0 inches/hour), rapid below this depth (6.0 to 20.0 inches/hour)
Landform: Stream terraces or hills
Parent material: Alluvium or eolian deposits
Slope range: 0 to 15 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-loamy, mixed Aridic Haploborolls

Typical Pedon

Cozberg fine sandy loam, in an area of Cozberg-Chinook fine sandy loams, 0 to 4 percent slopes, in

cropland; 500 feet north and 1,000 feet west of the southeast corner of sec. 23, T. 36 N., R. 12 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine pores; neutral; abrupt wavy boundary.
Bw—7 to 17 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; common fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few fine pores; mildly alkaline; clear wavy boundary.
Bk—17 to 24 inches; light gray (10YR 7/2) fine sandy loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few fine pores; many fine soft masses of lime; violently effervescent; moderately alkaline; abrupt wavy boundary.
2C1—24 to 42 inches; very pale brown (10YR 7/3) loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; few fine pores; lime coatings on underside of sand grains; violently effervescent; moderately alkaline; clear wavy boundary.
2C2—42 to 60 inches; very pale brown (10YR 7/3) gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; 25 percent pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Ap horizon
Value—2 or 3 moist
Chroma—2 or 3
Clay content—10 to 20 percent
Content of rock fragments—0 to 10 percent pebbles
Reaction—pH 6.6 to 7.8

Bw horizon
Value—3 or 4 moist
Chroma—2 or 3
Texture—Fine sandy loam, very fine sandy loam, or sandy loam
Clay content—10 to 18 percent
Content of rock fragments—0 to 15 percent
Reaction—pH 6.6 to 7.8

Bk horizon
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Fine sandy loam, sandy loam, or very fine sandy loam
Clay content—10 to 18 percent
Content of rock fragments—0 to 15 percent
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.4 to 8.4

2C horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loamy sand, sand, loamy coarse sand, or coarse sand
Clay content—0 to 10 percent
Content of rock fragments—0 to 35 percent pebbles
Reaction—pH 7.4 to 8.4

573B—Cozberg-Chinook fine sandy loams, 0 to 4 percent slopes

Setting

Landform: Cozberg—stream terraces; Chinook—stream terraces
Slope: Cozberg—0 to 4 percent; Chinook—0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Cozberg and similar soils: 45 percent
Chinook and similar soils: 40 percent

Minor Components

Busby and similar soils: 0 to 5 percent
Evanston, calcareous soils: 0 to 3 percent
Degrand and similar soils: 0 to 2 percent
Soils that have slopes more than 4 percent: 0 to 5 percent

Major Component Description

Cozberg

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland

Flooding: None
Available water capacity: About 5.0 inches

Chinook

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Flooding: None
Available water capacity: About 7.8 inches

Creed Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Creed loam, in an area of Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes, in rangeland; 900 feet south and 1,800 feet west of the northeast corner of sec. 1, T. 30 N., R. 10 E.

A—0 to 2 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak very fine platy structure parting to strong very fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; few very fine pores; neutral; clear smooth boundary.

E—2 to 7 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak coarse platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine pores; neutral; clear smooth boundary.

Btn1—7 to 9 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; strong medium and coarse columnar structure parting to strong medium angular blocky; very hard, very firm, very sticky and very plastic; common very fine roots; many very fine pores; many distinct clay films on faces of peds; neutral; clear smooth boundary.

Btn2—9 to 16 inches; light brownish gray (10YR 6/2) clay, very dark grayish brown (10YR 3/2) moist; strong fine and medium prismatic structure parting to strong medium subangular blocky; very hard, very firm, very sticky and very plastic; many very fine roots; common very fine pores; many distinct clay films on faces of peds; neutral; clear wavy boundary.

Bkn—16 to 29 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine roots; many very fine pores; few fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bknyz—29 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; many very fine pores; few fine and medium soft masses and threads of lime; few fine masses of gypsum and other salts; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or above
Depth to secondary lime: 10 to 20 inches
Depth to gypsum and other salts: 22 to 30 inches

A horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Clay content—20 to 27 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.1 to 8.4

E horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, 6, or 7 moist
Chroma—2 or 3
Clay content—20 to 27 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.1 to 8.4

Btn horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, or 6 dry; 3, 4, or 5 moist
Chroma—2 or 3

Texture—Clay loam, silty clay loam, clay, or silty clay
Clay content—35 to 55 percent
Content of rock fragments—0 to 15 percent pebbles
Electrical conductivity—2 to 4 mmhos/cm; sandy substratum phase 0 to 2 mmhos/cm
Sodium adsorption ratio—8 to 13
Reaction—pH 6.6 to 9.0

Bkn, Bknyz horizons
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Silty clay loam, clay loam, sandy clay loam, loam, or clay
Content of rock fragments—0 to 15 percent pebbles
Clay content—25 to 45 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—4 to 16 mmhos/cm
Sodium adsorption ratio—13 to 25
Gypsum—0 to 2 percent
Reaction—pH 7.9 to 9.0

Degrand Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate in the upper 0 to 26 inches (0.6 to 2.0 inches/hour); rapid below this depth (6.0 to 20.0 inches/hour)
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy over sandy or sandy skeletal, mixed Aridic Argiborolls

Typical Pedon

Degrand loam, 0 to 4 percent slopes, in an area of cropland; 500 feet north and 1,300 feet east of the southwest corner of sec. 18, T. 31 N., R. 11 E.

Ap—0 to 6 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to moderate very fine and fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine pores; mildly alkaline; abrupt smooth boundary.

Bt1—6 to 9 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; hard, friable, sticky and plastic; many very fine roots, many very fine pores; many faint clay films on faces of peds; neutral; clear smooth boundary.

Bt2—9 to 15 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; many very fine pores; many faint clay films on faces of peds; neutral; clear wavy boundary.

Bk—15 to 26 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; many very fine pores; many fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

2C1—26 to 48 inches; light brownish gray (2.5Y 6/2) loamy sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; many very fine pores; lime coatings on underside of pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

2C2—48 to 60 inches; light brownish gray (2.5Y 6/2) sand, grayish brown (2.5Y 5/2) moist; single grain, loose, nonsticky and nonplastic; many very fine pores; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in some part six-tenths or more of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher
Mollic epipedon thickness: 7 to 16 inches
Depth to calcic horizon: 10 to 23 inches
Depth to C horizon: 20 to 40 inches

Ap horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry; 2 or 3 moist
Chroma—2 or 3
Clay content—10 to 27 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Reaction—pH 6.6 to 7.8

Bt horizon
Hue—10YR or 2.5Y

Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Clay loam or sandy clay loam
Clay content—20 to 35 percent (sand content 35 to 55 percent)
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Reaction—pH 6.6 to 8.4

Bk horizon
Hue—10YR or 2.5Y
Value—6 or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Texture—Sandy clay loam, loam, or clay loam
Clay content—15 to 30 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Electrical conductivity—less than 4 mmhos/cm
Calcium carbonate equivalent—15 to 40 percent
Reaction—pH 7.4 to 8.4

2C horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Sand, coarse sand, fine sand, or loamy sand
Clay content—0 to 5 percent
Content of rock fragments—0 to 35 percent—0 to 5 percent cobbles, 0 to 30 percent pebbles
Calcium carbonate equivalent—8 to 15 percent
Reaction—pH 7.9 to 8.4

16B—Degrand loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Degrand and similar soils: 85 percent

Minor Components

Cozberg and similar soils: 0 to 4 percent
Busby and similar soils: 0 to 6 percent
Yamacall, calcareous soils: 0 to 2 percent
Soils that have slopes more than 4 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 5.2 inches

Delpoint Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains
Parent material: Semiconsolidated sedimentary beds
Slope range: 2 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed, frigid Aridic Ustochrepts

Typical Pedon

Delpoint loam, in an area of Delpoint complex, 2 to 8 percent slopes, in cropland; 1,000 feet north and 1,000 feet east of the southwest corner of sec. 30, T. 36 N., R. 10 E.

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5R 4/2) moist; weak fine and moderate subangular blocky structure parting to strong very fine granular; soft, very friable, slightly sticky and plastic; few very fine roots; many very fine pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.
Bw—5 to 14 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; many very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.
Bk1—14 to 20 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; many very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.
Bk2—20 to 34 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist;

moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; many very fine pores; many fine soft masses of lime; violently effervescent; strongly alkaline; gradual smooth boundary.

Cr—34 to 60 inches; gray (5Y 6/1) semiconsolidated sedimentary beds, olive gray (5Y 5/2) moist; effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches
Depth to Bk horizon: 10 to 20 inches
Depth to Cr horizon: 20 to 40 inches
Soil phases: Calcareous (more than 5 percent lime)

A horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 3, 4, or 5 moist
Chroma—2, 3, or 4
Clay content—18 to 27 percent
Content of rock fragments—0 to 5 percent pebbles
Effervescence—None to strong
Reaction—pH 6.6 to 8.4
Other features—When mixed to 7 inches the surface will not meet the requirements for a mollic epipedon

Bw horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Loam, clay loam, or silty clay loam
Clay content—18 to 35 percent clay
Content of rock fragments—0 to 15 percent pebbles
Effervescence—None to violent
Reaction—pH 6.6 to 8.4

Bk horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam, sandy loam, clay loam, or silty clay loam
Clay content—18 to 35 percent clay
Content of rock fragments—0 to 15 percent pebbles
Calcium carbonate equivalent—5 to 30 percent; there is not more than a 5 percent difference in calcium carbonate equivalent, or by volume of secondary carbonates in the underlying horizon of material to meet the requirements of a calcic horizon
Effervescence—Strong or violent
Reaction—pH 7.9 to 9.0

172C—Delpoint complex, 2 to 8 percent slopes

Setting

Landform: Delpoint—sedimentary plains; Delpoint—sedimentary plains
Position on landform: Delpoint—shoulders; Delpoint—back slopes
Slope: Delpoint—2 to 8 percent; Delpoint—2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Delpoint, calcareous and similar soils: 50 percent
Delpoint and similar soils: 35 percent

Minor Components

Twilight and similar soils: 0 to 5 percent
Yawdim and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 2 percent
Marmarth and similar soils: 0 to 3 percent
Evanston and similar soils: 0 to 2 percent

Major Component Description

Delpoint, calcareous

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 5.5 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 5.5 inches
Phase: Calcareous

171C—Delpoint-Cabbart loams, 2 to 8 percent slopes

Setting

Landform: Delpoint—sedimentary plains; Cabbart—sedimentary plains
Position on landform: Delpoint—back slopes; Cabbart—shoulders
Slope: Delpoint—2 to 8 percent; Cabbart—2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Delpoint and similar soils: 55 percent
Cabbart and similar soils: 30 percent

Minor Components

Twilight and similar soils: 0 to 3 percent
Blacksheep and similar soils: 0 to 4 percent
Yamacall, calcareous soils: 0 to 7 percent
Very shallow soils: 0 to 1 percent

Major Component Description

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 5.5 inches

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.3 inches

DA—Denied access

Composition

Major Components

Denied access: 100 percent

Major Component Description

Definition: Areas where mapping access was denied by landowner

Dimmick Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Very poorly drained
Permeability: Very slow (0.06 inch/hour)
Landform: Closed depressions
Parent material: Alluvium
Slope range: 0 to 1 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic, frigid Vertic Epiaquolls

Typical Pedon

Dimmick clay, 0 to 1 percent slopes, in an area of cropland; 100 feet north and 100 feet east of the southwest corner of sec. 19, T. 34 N., R. 15 E.

Ap—0 to 3 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; common fine faint yellowish brown (10YR 5/4) redox concentrations; strong very fine and fine angular blocky structure; very hard, very firm, very sticky and very plastic; many very fine and fine roots; few very fine pores; slightly acid; clear wavy boundary.

Ag—3 to 21 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; common fine faint yellowish brown (10YR 5/4) redox concentrations; weak fine angular blocky structure; very hard, very firm, very sticky and very plastic; many fine and common very fine roots; few very fine pores; neutral; clear wavy boundary.

Cg1—21 to 42 inches; light gray (5Y 6/1) clay, dark gray (5Y 4/1) moist; massive; common medium faint yellowish brown (10YR 5/4) redox concentrations; very hard, very firm, very sticky and very plastic; common fine roots; few very fine pores; slightly effervescent; mildly alkaline; gradual wavy boundary.

Cg2—42 to 60 inches; light gray (5Y 6/1) clay, dark gray (5Y 4/1) moist; common medium faint yellowish brown (10YR 5/4) redox concentrations; massive; very hard, very firm, very sticky and very plastic; strongly effervescent; mildly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches

Depth to lime: 20 to 40 inches
Depth to water table: Pooled to 12 inches

A horizon
Hue—10YR, 2.5Y or 5Y
Value—2 or 3 moist; 4 or 5 dry
Chroma—1 or 2
Clay content—40 to 50 percent
Reaction—pH 6.1 to 7.8

C horizon
Hue—2.5Y, or 5Y
Value—4, 5, 6, 7, or 8 moist or dry
Chroma—0, 1, 2, or 3
Texture—Clay or silty clay
Clay content—40 to 60 percent clay
Reaction—pH 6.6 to 8.4

34A—Dimmick clay, 0 to 1 percent slopes

Setting

Landform: Closed depressions
Slope: 0 to 1 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Dimmick and similar soils: 85 percent

Minor Components

McKenzie and similar soils: 0 to 10 percent
Scobey and similar soils: 0 to 3 percent
Marias and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Ponding: Long
Available water capacity: About 10.3 inches

Eagleton Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Poorly drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 70 to 110 days

Taxonomic Class: Fine-loamy, mixed, frigid Cumulic Endoaquolls

Typical Pedon

Eagleton loam, in an area of Enbar-Straw-Eagleton loams, 0 to 2 percent slopes, in rangeland; 800 feet south and 1,900 feet west of the northeast corner of sec. 18, T. 29 N., R. 17 E.

A—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; common fine and medium distinct yellowish brown (10YR 5/6) redox concentrations; weak fine granular structure; slightly hard, very friable, sticky and slightly plastic; many very fine and fine roots; many very fine pores; neutral; clear smooth boundary.

C1—7 to 21 inches; dark gray (10YR 4/1) stratified loam and clay loam, very dark gray (10YR 3/1) moist; many fine and medium distinct yellowish brown (10YR 5/4) redox concentrations; weak fine and medium subangular blocky structure; hard, friable, sticky and plastic; common fine and many very fine roots; many very fine pores; neutral; clear wavy boundary.

C2—21 to 37 inches; dark grayish brown (10YR 4/2) stratified loam and clay loam, very dark grayish brown (10YR 3/2) moist; many fine and medium distinct yellowish brown (10YR 5/4) redox concentrations; massive; hard, friable, sticky and plastic; common very fine roots; common very fine pores; mildly alkaline; clear wavy boundary.

Cg—37 to 60 inches; gray (5Y 5/1) stratfied loam, clay loam, and fine sandy loam, dark gray (5Y 4/1) moist; many fine and medium distinct yellowish brown (10YR 5/4) redox concentrations; massive; hard, friable, sticky and plastic; few very fine roots; common very fine pores; neutral.

Range in Characteristics

Depth to seasonal high water table: 12 to 24 inches

A horizon
Value—3, 4, or 5 dry; 2 or 3 moist
Clay content—18 to 27 percent
Reaction—pH 6.6 to 7.8

C and Cg horizons
Hue—10YR, 5Y, or N
Value—4 or 5 dry; 2, 3, 4, or 5 moist
Chroma—0, 1, or 2

Redoximorphic features: None to common; Hue 10YR; Value 5 or 6 dry, 4 moist; Chroma 4 or 6
Texture—Loam or clay loam consisting of thin layers of sandy loam, fine sandy loam, sandy clay loam, clay loam, or silty clay loam
Clay content—18 to 35 percent
Reaction—pH 6.6 to 7.8

Elkner Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid in the upper 0 to 36 inches (2.0 to 6.0 inches/hour); rapid below this depth (6.0 to 20.0 inches/hour)
Landform: Mountains
Parent material: Colluvium
Slope range: 25 to 70 percent
Annual precipitation: 20 to 22 inches
Annual air temperature: 38 to 40 degrees F
Frost-free period: 50 to 70 days

Taxonomic Class: Coarse-loamy, mixed, frigid Typic Cryochrepts

Typical Pedon

Elkner sandy loam, in an area of Garlet-Elkner complex, 25 to 70 percent slopes, in woodland; 150 feet south and 2,000 feet west of the northeast corner of sec. 24, T. 28 N., R. 16 E.

Oi—2 inches to 0; forest litter of slightly decomposed needles, twigs, and leaves.
E1—0 to 6 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak medium granular structure; loose, very friable, nonsticky and nonplastic; many fine and medium roots; many very fine and fine pores; moderately acid; clear smooth boundary.
E2—6 to 16 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak moderate subangular blocky structure; soft, very friable, nonsticky and nonplastic; many medium and fine roots; slightly acid; clear wavy boundary.
E and Bt—16 to 36 inches; 80 percent pale brown (10YR 6/3) coarse sandy loam, brown (10YR 5/3) moist (E part); 20 percent brown (10YR 5/3) sandy loam lamellae, dark brown (10YR 4/3) moist (Bt part); weak medium granular structure; soft, nonsticky and nonplastic; common very fine and fine roots; common fine pores; slightly acid; clear wavy boundary.
BC—36 to 60 inches; light yellowish brown (10YR 6/4) gravelly loamy coarse sand, yellowish brown (10YR 5/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots, 10 percent cobbles, 10 percent pebbles; slightly acid.

Range in Characteristics

E horizon
Value—6 or 7 dry; 3, 4, or 5 moist
Chroma—2, 3, or 4
Clay content—5 to 10 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, stones, or boulders, 0 to 10 percent pebbles
Reaction—pH 5.6 to 6.5

E and Bt horizons
Hue—E part—10YR; B part—10YR or 2.5Y
Value—E part—6 or 7 dry and 4 or 5 moist; B part—4 or 5 dry and 4 or 5 moist
Chroma—E part—2, 3, or 4; B part—3 or 4
Texture—Coarse sandy loam or sandy loam
Clay content—5 to 10 percent, lamellae has less than 3 percent increase in clay
Content of rock fragments—0 to 20 percent—0 to 15 percent cobbles, stones, or boulders, 5 to 20 percent pebbles
Reaction—pH 5.6 to 6.5

BC horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 3, 4, or 5 moist
Chroma—2, 3, or 4
Texture—Loamy coarse sand or coarse sandy loam
Clay content—0 to 5 percent
Structure—Single grain to subangular blocky
Content of rock fragments—0 to 35 percent—0 to 20 percent cobbles and stones, 5 to 20 percent pebbles
Reaction—pH 5.6 to 7.3
Other features—The dark colors are lithochromic

Elloam Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (0.06 inch/hour)
Landform: Till plains
Parent material: Glacial till
Slope range: 0 to 8 percent
Annual precipitation: 10 to 13 inches

Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Elloam clay loam, in an area of Phillips-Elloam complex, 0 to 4 percent slopes, in rangeland; 300 feet north and 100 feet west of the southeast corner of sec. 16, T. 36 N., R. 10 E.

E—0 to 4 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak very fine platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine pores; neutral; abrupt smooth boundary.

Bt1—4 to 7 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong medium and coarse columnar structure parting to strong fine angular blocky; very hard, very firm, very sticky and very plastic; many very fine roots, common very fine pores; many distinct clay films on faces of peds; neutral; clear smooth boundary.

Bt2—7 to 13 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; strong medium and coarse angular blocky structure; very hard, very firm, very sticky and very plastic; common very fine roots; many very fine pores; many faint clay films on faces of peds; moderately alkaline; clear wavy boundary.

Bkn—13 to 18 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, firm, very sticky and plastic; few very fine roots; many very fine pores; common fine soft masses of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bknyz1—18 to 33 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; many very fine pores; common medium soft masses of lime; few fine masses of gypsum and other salts; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bknyz2—33 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure parting to moderate fine angular blocky; very hard, firm, very stickly and plastic; few very fine roots; many very fine pores; few fine soft masses of lime; common fine masses of gypsum and other salts; slightly effervescent; strongly alkaline.

Range in Characteristics

E horizon

Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2 or 3
Clay content—20 to 27 percent
Content of rock fragments—0 to 15 percent—0 to trace stones, 0 to 5 percent cobbles, 0 to 10 percent pebbles
Electrical conductivity—0 to 2 mmhos/cm
Reaction—pH 6.1 to 7.8
Other features—The surface layer is crusted in the natural state and is also crusted where cultivated

Bt horizon

Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 3, 4, or 5 moist
Chroma—2 or 3
Texture—Clay loam or clay
Clay content—35 to 55 percent
Structure—Strong or medium columnar, prismatic, or blocky
Content of rock fragments—0 to 15 percent—0 to trace cobbles, 0 to 15 percent pebbles
Sodium adsorption ratio—8 to 25
Electrical conductivity—2 to 8 mmhos/cm
Reaction—pH 6.6 to 9.0
Other features—Pedons that have less than 15 percent ESP have more exchangeable Mg plus sodium than calcium plus exchange acidity at pH 8.2

Bkn horizon

Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Texture—Clay loam or clay
Clay content—30 to 45 percent
Content of rock fragments—0 to 15 percent—0 to trace cobbles, 0 to 15 percent pebbles
Sodium adsorption ratio—13 to 25
Electrical conductivity—4 to 8 mmhos/cm
Reaction—pH 7.9 to 9.0

Bknyz horizon

Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—1, 2, or 3
Texture—Loam or clay loam
Clay content—25 to 40 percent
Content of rock fragments—0 to 15 percent—0 to trace cobbles, 0 to 15 percent pebbles
Sodium adsorption ratio—13 to 25

Electrical conductivity—8 to 16 mmhos/cm
Reaction—pH 7.9 to 9.0

522A—Elloam-Absher complex, 0 to 2 percent slopes

Setting

Landform: Elloam—till plains; Absher—till plains
Position on landform: Elloam—microhighs; Absher—microlows
Slope: Elloam—0 to 2 percent; Absher—0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Elloam and similar soils: 50 percent
Absher and similar soils: 35 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Hillon and similar soils: 0 to 5 percent
Thoeny and similar soils: 0 to 5 percent
Soils that have slopes more than 2 percent: 0 to 4 percent

Major Component Description

Elloam

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.5 inches

Absher

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 3.9 inches

Enbar Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 13 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 70 to 110 days

Taxonomic Class: Fine-loamy, mixed Cumulic Haploborolls

Typical Pedon

Enbar loam, in an area of Enbar-Straw-Eagleton loams, 0 to 2 percent slopes, in rangeland; 2,400 feet south and 100 feet east of the northwest corner of sec. 18, T. 30 N., R. 16 E.

A1—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and very fine granular structure; slightly hard, very friable, sticky and slightly plastic; few fine roots, many very fine roots; many very fine pores; mildly alkaline; clear smooth boundary.

A2—7 to 23 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; hard, very friable, sticky and slightly plastic; many very fine roots, common very fine pores; mildly alkaline; clear wavy boundary.

C—23 to 30 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; many fine distinct dark yellowish brown (10YR 4/6) redox concentrations; massive; hard, friable, sticky and plastic; common very fine roots; few very fine pores; effervescent; moderately alkaline; clear wavy boundary.

Cg1—30 to 53 inches; gray (5Y 5/1) stratified loam and clay loam, dark gray (5Y 4/1) moist; many fine and medium prominent yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) redox concentrations; massive; hard, friable, sticky and plastic; few very fine roots; few very fine pores; effervescent; moderately alkaline; gradual wavy boundary.

Cg2—53 to 60 inches; gray (5Y 5/1) stratified loam, sandy loam and clay loam, dark gray (5Y 4/1) moist; many fine and medium prominent yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) redox concentrations; massive; hard, friable,

slightly sticky and slightly plastic; few very fine roots; few very fine pores; effervescent; moderately alkaline.

Range in Characteristics

Water table: 36 to 60 inches

A horizon
Hue—5YR, 7.5YR, or 10YR
Value—4 or 5 dry; 2 or 3 moist
Chroma—1, 2, 4, or 6
Clay content—18 to 27 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.6 to 8.4

C horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, or 6 dry; 4 or 5 moist
Chroma—1 or 2
Redox concentrations—Few to common, 10YR 5/4, 10YR 4/6, or 10YR 4/4
Texture—Loam or clay loam
Clay content—18 to 30 percent
Content of rock fragments—0 to 15 percent pebbles
Effervescence—Strong or violent
Reaction—pH 7.9 to 8.4

Cg horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, or 6 dry; 4 or 5 moist
Chroma—0, 1, or 2
Redox concentrations—Few to common, 10YR 3/4, 10YR 5/6, or 10YR 6/6
Texture—Loam with stratification of sandy loam, silty clay loam, and clay loam
Clay content—18 to 27 percent
Content of rock fragments—0 to 15 percent pebbles
Effervescence—Strong or violent
Reaction—pH 7.9 to 8.4

833A—Enbar-Straw-Eagleton loams, 0 to 2 percent slopes

Setting

Landform: Enbar—flood plains; Straw—flood plains; Eagleton—flood plains
Slope: Enbar—0 to 2 percent; Straw—0 to 2 percent; Eagleton—0 to 2 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Enbar and similar soils: 35 percent
Straw and similar soils: 30 percent
Eagleton and similar soils: 20 percent

Minor Components

Eagleton, frequently flooded: 0 to 2 percent
Nesda and similar soils: 0 to 4 percent
Hanly and similar soils: 0 to 2 percent
Havre and similar soils: 0 to 5 percent
Soils that have slopes more than 2 percent: 0 to 2 percent

Major Component Description

Enbar

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Water table: Apparent
Available water capacity: About 10.0 inches

Straw

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: About 10.7 inches

Eagleton

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Water table: Apparent
Available water capacity: About 10.6 inches

Ethridge Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans, stream terraces, or drainageways

Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Ethridge clay loam, 0 to 2 percent slopes, in an area of cropland; 500 feet south and 500 feet east of the northwest corner of sec. 4, T. 30 N., R. 14 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; hard, friable, sticky and plastic; many very fine and fine roots; many fine pores; neutral; abrupt wavy boundary.

Bt1—7 to 10 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong coarse prismatic structure parting to strong fine angular blocky; extremely hard, very firm, very sticky and very plastic; common very fine and fine roots; common fine pores; many distinct clay films on faces of peds; neutral; clear wavy boundary.

Bt2—10 to 15 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium angular blocky; extremely hard, very firm, very sticky and very plastic; common fine and medium roots; common fine pores; common distinct clay films on faces of peds; neutral; clear wavy boundary.

Bk—15 to 33 inches; very pale brown (10YR 7/3) silty clay loam, pale brown (10YR 6/3) moist; weak coarse subangular blocky structure; hard, firm, sticky and very plastic; few fine and medium roots; few fine and medium pores; common medium soft masses of lime; moderately alkaline; strongly effervescent; clear wavy boundary.

Bky—33 to 60 inches; very pale brown (10YR 7/3) silty clay loam, pale brown (10YR 6/3) moist; massive; very hard, firm, very sticky and very plastic; few fine and medium roots; few fine pores; common medium filaments of lime; few fine masses of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches
Mollic epipedon thickness: 7 to 14 inches; may include all or part of the Bt horizon
Depth to Bk horizon: 10 to 20 inches

Ap horizon
Hue—10YR or 2.5Y
Value—2 or 3 moist
Chroma—2 or 3
Clay content—27 to 35 percent
Content of rock fragments—0 to 5 percent pebbles
Reaction—pH 6.1 to 7.8

Bt horizon
Hue—10YR or 2.5Y
Value—3 or 4 moist
Chroma—2, 3, or 4
Texture—Clay, silty clay, clay loam, or silty clay loam
Clay content—35 to 45 percent
Content of rock fragments—0 to 5 percent pebbles
Reaction—pH 6.6 to 8.4

Bk horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Clay, silty clay loam, clay loam, or silty clay
Clay content—30 to 45 percent
Content of rock fragments—0 to 5 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.4 to 8.4

Bky horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Clay loam, silt loam, loam, or silty clay loam (these textures consist of strata of finer and coarser materials)
Clay content—25 to 40 percent
Content of rock fragments—0 to 5 percent pebbles
Electrical conductivity—0 to 4 mmhos/cm
Calcium carbonate equivalent—5 to 15 percent
Gypsum—1 to 3 percent
Reaction—pH 7.4 to 8.4

381A—Ethridge clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Ethridge and similar soils: 85 percent

Minor Components

Kobase, calcareous soils: 0 to 3 percent
Marias and similar soils: 0 to 1 percent
Degrand and similar soils: 0 to 9 percent
Soils that have slopes more than 2 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.8 inches

Evanston Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Till plains, drainageways, alluvial fans, and stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Evanston loam, 0 to 2 percent slopes, in an area of cropland; 1,200 feet north and 900 feet east of the southwest corner of sec. 35, T. 30 N., R. 10 E.

Ap—0 to 7 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; strong very fine and fine granular structure; soft, friable, sticky and slightly plastic; many very fine roots and few fine roots; many very fine pores; neutral; clear smooth boundary.

Bt—7 to 18 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium and coarse prismatic structure parting to strong medium subangular blocky; hard, firm, sticky and plastic; many very fine roots; many very fine pores; common distinct clay films on faces of peds; neutral; clear smooth boundary.

Bk1—18 to 28 inches; light gray (10YR 7/2) clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; many very fine roots; many very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—28 to 40 inches; light yellowish brown (2.5Y 6/4) loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and plastic; common very fine roots; many very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—40 to 60 inches; light yellowish brown (2.5Y 6/4) loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and plastic; few very fine roots; common very fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches
Depth to Bk horizon: 8 to 20 inches

A horizon
Hue—2.5Y through 7.5YR
Value—3, 4, or 5 dry; 2 or 3 moist
Chroma—2 or 3 dry and moist
Clay content—20 to 27 percent
Reaction—pH 6.6 to 7.8

Bt horizon
Hue—2.5Y through 7.5YR
Value—3, 4, 5 ,or 6 dry; 3, 4, or 5 moist
Chroma—2, 3, or 4 dry and moist
Texture—Clay loam, sandy clay loam, or loam
Clay content—25 to 35 percent
Reaction—pH 6.6 to 7.8

Bk horizon
Hue—2.5Y through 7.5YR
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—3 or 4 dry and moist
Texture—Loam, clay loam, or sandy clay loam
Clay content—20 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.9 to 8.4

37A—Evanston loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Evanston and similar soils: 85 percent

Minor Components

Kremlin and similar soils: 0 to 1 percent
Yamacall, calcareous soils: 0 to 4 percent
Degrand and similar soils: 0 to 8 percent
Soils that have slopes more than 2 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

375B—Evanston-Lonna loams, 0 to 4 percent slopes

Setting

Landform: Evanston—till plains; Lonna—till plains
Position on landform: Evanston—foot slopes; Lonna—back slopes
Slope: Evanston—0 to 4 percent; Lonna—0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Evanston and similar soils: 55 percent
Lonna and similar soils: 30 percent

Minor Components

Chinook and similar soils: 0 to 3 percent
Ethridge and similar soils: 0 to 5 percent
Yamacall, calcareous soils: 0 to 3 percent
Busby and similar soils: 0 to 4 percent

Major Component Description

Evanston

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Lonna

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Farnuf Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Farnuf loam, 4 to 8 percent slopes, in an area of rangeland; 600 feet south and 1,800 feet east of the northwest corner of sec. 35, T. 30 N., R. 15 E.

A—0 to 9 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; medium very fine granular structure; slightly hard, very friable, sticky and plastic; many very fine roots; many fine pores; neutral; clear smooth boundary.

Bt—9 to 18 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, friable, sticky and plastic; many very fine roots, many

very fine pores; common faint clay films on faces of peds; neutral; clear smooth boundary.

Bk1—18 to 26 inches; light brownish gray (10YR 6/2) clay loam, brown (10YR 5/3) moist; moderate fine and medium angular blocky structure; very hard, friable, sticky and plastic; many fine roots; many very fine pores; common fine soft masses and seams of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—26 to 38 inches; light brownish gray (10YR 6/2) clay loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine pores; common fine soft masses and seams of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk3—38 to 60 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine pores; common fine and medium soft masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Moisture control section: Between 4 and 12 inches
Mollic epipedon thickness: 7 to 15 inches
Depth to Bk horizon: 10 to 25 inches

A horizon
Hue—2.5Y or 10YR
Value—3, 4, or 5 dry; 2 or 3 moist
Chroma—2 or 3
Clay content—15 to 27 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles and stones, 0 to 10 percent pebbles
Reaction—pH 6.1 to 7.8

Bt horizon
Hue—2.5Y, 10YR, or 7.5YR
Value—3, 4, 5, or 6 dry; 2, 3, or 4 moist
Chroma—2, 3, or 4
Texture—Loam, clay loam, or silty clay loam
Clay content—25 to 35 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.1 to 7.8
Other features—Some pedons have a thin Btk horizon

Bk horizon
Hue—2.5Y, 10YR, or 7.5YR
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Fine sandy loam, loam, silt loam, silty clay loam, or clay loam
Clay content—20 to 30 percent
Content of rock fragments—0 to 15 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.4 to 8.4

75B—Farnuf loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 4 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Farnuf and similar soils: 85 percent

Minor Components

Bowery and similar soils: 0 to 7 percent
Farnuf, calcareous soils: 0 to 4 percent
Soils that have slopes more than 4 percent: 0 to 4 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.8 inches

75C—Farnuf loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 8 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Farnuf and similar soils: 85 percent

Minor Components

Bowery and similar soils: 0 to 5 percent

Farnuf, calcareous soils: 0 to 5 percent
Soils that have slopes more than 8 percent: 0 to 3 percent
Soils that have slopes less than 4 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.8 inches

Ferd Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains and stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic Glossic Eutroboralfs

Typical Pedon

Ferd loam, in an area of Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes, in cropland; 150 feet north and 1,600 feet west of the southeast corner of sec. 13, T. 32 N., R. 13 E.

Ap—0 to 4 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate very fine granular structure; soft, very friable, sticky and slightly plastic; common very fine roots; neutral; clear smooth boundary.

E/Bt—4 to 7 inches; 60 percent light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist (E part); 40 percent grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist (B part); moderate very thin platy structure parting to moderate very fine granular; soft, very friable, sticky and slightly plastic; common very fine roots; many very fine pores; few faint clay films on ped faces; neutral; abrupt smooth boundary.

Bt—7 to 15 inches; grayish brown (10YR 5/2) clay, dark brown (10YR 3/3) moist; moderate fine and medium prismatic structure parting to strong fine and medium subangular blocky; very hard, very firm, very sticky and very plastic; common very fine roots; common very fine pores; many faint clay films on faces of peds; neutral; clear wavy boundary.

Bk1—15 to 27 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium prismatic structure parting to strong fine and medium subangular blocky; hard, firm, sticky and very plastic; common very fine roots; many very fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—27 to 42 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; strong fine and medium subangular blocky structure; hard, firm, sticky and very plastic; few very fine roots; many very fine pores; many fine soft masses of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bky—42 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/4) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and very plastic; many very fine pores; common fine soft masses of lime; few fine seams of gypsum; violently effervescent; strongly alkaline.

Range in Characteristics

Ap horizon
Hue—10YR or 2.5Y
Value—3 or 4 moist
Clay content—20 to 27 percent
Reaction—pH 6.6 to 7.3

E/Bt horizon
Hue—10YR or 2.5Y
Texture—Loam, clay loam, or silty clay loam
Clay content—22 to 35 percent
Reaction—pH 6.6 to 7.3

Bt horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry
Chroma—2 or 3
Texture—Clay loam, silty clay loam, or clay
Clay content—35 to 50 percent
Electrical conductivity—less than 2 mmhos/cm
Reaction—pH 6.6 to 8.4

Bk1 and Bk2 horizons
Hue—10YR or 2.5Y
Value—6 or 7 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Clay loam or silty clay loam
Clay content—27 to 40 percent
Calcium carbonate equivalent—5 to 15 percent
Sodium adsorption ratio—0 to 13
Electrical conductivity—2 to 8 mmhos/cm
Reaction—pH 7.9 to 9.0

Bky horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay loam or silty clay loam
Clay content—27 to 40 percent
Calcium carbonate equivalent—5 to 15 percent
Sodium adsorption ratio—8 to 13
Electrical conductivity—4 to 8 mmhos/cm
Gypsum—1 to 3 percent
Reaction—pH 8.4 to 9.6

31A—Ferd loam, 0 to 2 percent slopes

Setting

Landform: Till plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Ferd and similar soils: 85 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Creed and similar soils: 0 to 5 percent
Ethridge and similar soils: 0 to 7 percent
Soils that have slopes more than 2 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

311B—Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes

Setting

Landform: Ferd—stream terraces; Creed—stream terraces; Gerdrum—stream terraces
Position on landform: Ferd—microhighs; Creed—microlows; Gerdrum—microlows
Slope: Ferd—0 to 4 percent; Creed—0 to 4 percent; Gerdrum—0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Ferd and similar soils: 35 percent
Creed and similar soils: 25 percent
Gerdrum and similar soils: 25 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Ethridge and similar soils: 0 to 6 percent
Kobase, calcareous soils: 0 to 3 percent
Soils that have sandy layers below 40 inches: 0 to 5 percent

Major Component Description

Ferd

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

Creed

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.6 inches

Gerdrum

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.0 inches

Fortbenton Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid in the upper 0 to 26 inches (2.0 to 6.0 inches/hour); slow below this depth (0.06 to 0.2 inch/hour)
Landform: Till plains and hills
Parent material: Glaciofluvial deposits
Slope range: 0 to 25 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed Aridic Haploborolls

Typical Pedon

Fortbenton fine sandy loam, 0 to 4 percent slopes, in an area of cropland; 1,300 feet north and 1,000 feet west of the southeast corner of sec. 34, T. 34 N., R. 11 E.

Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots; neutral; abrupt smooth boundary.

Bw1—6 to 11 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; few very fine pores; neutral; clear wavy boundary.

Bw2—11 to 26 inches; yellowish brown (10YR 5/4) fine sandy loam, dark brown (10YR 4/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine roots; few very fine pores; neutral; abrupt wavy boundary.

2Bk1—26 to 40 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine pores; common fine soft masses and threads of lime; violently effervescent; moderately alkaline, abrupt wavy boundary.

2Bk2—40 to 53 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

2Bk3—53 to 60 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine pores; common fine soft masses of lime; violently effervescent; strongly alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches
Depth to the Bk horizon: 15 to 30 inches

Ap horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry
Chroma—2 or 3
Texture—Fine sandy loam or loam
Clay content—5 to 18 percent
Reaction—pH 6.6 to 7.8

Bw1 horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Fine sandy loam or sandy loam
Clay content—5 to 18 percent
Reaction—pH 6.6 to 7.8

Bw2 horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry
Chroma—2, 3, or 4
Texture—Fine sandy loam or sandy loam
Clay content—5 to 18 percent
Reaction—pH 6.6 to 7.8

2Bk horizon
Hue—10YR or 2.5Y
Value—6 or 7 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay loam, silty clay loam, or silt loam
Clay content—27 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Reaction—pH 7.9 to 8.4

96B—Fortbenton fine sandy loam, 0 to 4 percent slopes

Setting

Landform: Till plains
Slope: 0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Fortbenton and similar soils: 85 percent

Minor Components

Chinook and similar soils: 0 to 8 percent
Soils that have slopes more than 4 percent: 0 to 5 percent
Hillon and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

96C—Fortbenton fine sandy loam, 4 to 8 percent slopes

Setting

Landform: Till plains
Slope: 4 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Fortbenton and similar soils: 85 percent

Minor Components

Chinook and similar soils: 0 to 7 percent
Hillon and similar soils: 0 to 3 percent
Soils that have slopes less than 4 percent: 0 to 1 percent
Soils that have slopes more than 8 percent: 0 to 4 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

962B—Fortbenton loam, 0 to 4 percent slopes

Setting

Landform: Till plains
Slope: 0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Fortbenton and similar soils: 85 percent

Minor Components

Fortbenton fine sandy loam: 0 to 4 percent
Kenilworth and similar soils: 0 to 6 percent
Hillon and similar soils: 0 to 2 percent
Soils that have slopes more than 4 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

965B—Fortbenton-Chinook fine sandy loams, 0 to 6 percent slopes

Setting

Landform: Fortbenton—till plains; Chinook—till plains; *Position on landform:* Fortbenton—back slopes; Chinook—back slopes
Slope: Fortbenton—0 to 6 percent; Chinook—0 to 6 percent

Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Fortbenton and similar soils: 50 percent
Chinook and similar soils: 35 percent

Minor Components

Kremlin and similar soils: 0 to 8 percent
Hillon and similar soils: 0 to 3 percent
Joplin gravelly loam: 0 to 4 percent

Major Component Description

Fortbenton

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Chinook

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Flooding: None
Available water capacity: About 7.8 inches

968C—Fortbenton-Hillon complex, 2 to 8 percent slopes

Setting

Landform: Fortbenton—till plains; Hillon—till plains
Position on landform: Fortbenton—back slopes; Hillon—shoulders
Slope: Fortbenton—2 to 8 percent; Hillon—2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Fortbenton and similar soils: 50 percent
Hillon and similar soils: 35 percent

Minor Components

Joplin gravelly loam: 0 to 5 percent
Fortbenton, calcareous soils: 0 to 5 percent
Soils that have slopes more than 8 percent: 0 to 5 percent

Major Component Description

Fortbenton

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Hillon

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.0 inches

Garlet Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Mountains
Parent material: Colluvium
Slope range: 25 to 70 percent
Annual precipitation: 20 to 22 inches
Annual air temperature: 38 to 40 degrees F
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed Typic Cryochrepts

Typical Pedon

Garlet cobbly loam, in an area of Garlet-Elkner complex, 25 to 70 percent slopes, in woodland; 150 feet south and 2,500 feet west of the northeast corner of sec. 29, T. 28 N., R. 16 E.

Oi—2 to 0 inches; forest litter of slightly decomposed needles, twigs, and leaves.

E1—0 to 4 inches; brown (10YR 5/3) cobbly loam, brown (10YR 4/3) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine and fine pores; 10 percent pebbles, 35 percent cobbles; moderately acid; clear smooth boundary.

E2—4 to 16 inches; brown (10YR 5/3) extremely cobbly loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly phastic; common fine and medium roots; common fine pores; 5 percent pebbles, 60 percent cobbles; slightly acid; clear wavy boundary.

Bw/E—16 to 28 inches; 80 percent yellowish brown (10YR 5/4) extremely cobbly sandy clay loam, dark yellowish brown (10YR 4/4) moist (B part), 20 percent light yellowish brown (10YR 6/4) yellowish brown (10YR 5/4) moist (E part); weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine pores; 5 percent pebbles, 65 percent cobbles; slightly acid; clear wavy boundary.

C—28 to 60 inches; light yellowish brown (10YR 6/4) extremely cobbly sandy clay loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; 5 percent pebbles; 65 percent cobbles; slightly acid.

Range in Characteristics

E1 horizon

Hue—10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—1, 2, or 3
Clay content—10 to 25 percent
Content of rock fragments—15 to 35 percent—10 to 15 percent cobbles and stones, 5 to 20 percent pebbles
Reaction—pH 5.6 to 6.5

E2 horizon

Hue—10YR or 7.5YR
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, 4
Texture—Loam or sandy loam
Clay content—10 to 25 percent
Content of rock fragments—35 to 85 percent—10 to 40 percent cobbles and stones, 25 to 60 percent pebbles
Reaction—pH 5.6 to 6.5

Bw/E horizon

Hue—B part—10YR or 7.5YR; E part—10YR or 7.5YR
Value—B part—6 or 7 dry and 4 or 5 moist; E part—5 or 6 dry and 4 or 5 moist
Chroma—2, 3, or 4
Texture—Sandy clay loam, sandy loam, or loam
Clay content—10 to 25 percent
Content of rock fragments—40 to 80 percent—15 to 40 percent cobbles and stones, 25 to 60 percent pebbles
Reaction—pH 5.6 to 7.8
Other features—Some pedons have E/B horizons

C horizon

Hue—10YR, 2.5Y, or 7.5YR
Value—6 or 7 dry; 5 or 6 moist
Chroma—2, 3, 4
Texture—Loam, sandy loam, or sandy clay loam
Clay content—5 to 25 percent
Content of rock fragments—45 to 80 percent
Reaction—pH 6.1 to 8.4

182F—Garlet-Elkner complex, 25 to 70 percent slopes

Setting

Landform: Garlet—mountains; Elkner—mountains
Position on landform: Garlet—back slopes; Elkner—back slopes
Slope: Garlet—25 to 70 percent; Elkner—25 to 70 percent
Mean annual precipitation: 20 to 22 inches
Frost-free period: 50 to 70 days

Composition

Major Components

Garlet and similar soils: 50 percent
Elkner and similar soils: 35 percent

Minor Components

Warwood and similar soils: 0 to 5 percent
Soils that have bedrock at 10 to 60 inches: 0 to 7 percent
Soils that are very gravelly below 30 inches: 0 to 2 percent
Areas of rubble land: 0 to 1 percent

Major Component Description

Garlet

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: About 4.5 inches

Elkner

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: About 4.5 inches

Gerdrum Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (0.06 inch/hour)
Landform: Till plains and stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Gerdrum clay loam, in an area of Gerdrum-Absher-Creed complex, 0 to 2 percent slopes, in rangeland; 100 feet south and 950 feet east of the northwest corner of sec. 1, T. 36 N., R. 8 E.

E—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; few very fine pores; mildly alkaline; abrupt smooth boundary.

Btn1—3 to 11 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong coarse columnar structure parting to strong medium angular blocky; very hard, firm, very sticky and very plastic; common very fine roots; many very fine pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Btn2—11 to 19 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; strong coarse prismatic structure parting to strong medium angular blocky; very hard, firm, very sticky and very plastic; common very fine roots; common very fine pores; many distinct clay films on faces of peds; moderately alkaline; clear wavy boundary.

Bknyz1—19 to 28 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; common very fine pores; common fine and medium soft masses and threads of lime; common fine masses of gypsum and other salts; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bknyz2—28 to 36 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine pores; common fine soft masses of lime; common fine masses of gypsum and other salts; violently effervescent; strongly alkaline; gradual wavy boundary.

Bknyz3—36 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine pores; common fine soft masses of lime; common fine masses of gypsum and other salts; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or above
Depth to Bknyz horizon: 10 to 28 inches

E horizon
Hue—10YR or 2.5Y
Value—6 or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Clay content—27 to 40 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.6 to 7.8

Btn1 horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay, silty clay, or silty clay loam
Clay content—35 to 55 percent
Content of rock fragments—0 to 10 percent pebbles

Structure—Fine to coarse columnar or medium or coarse blocky
Hardness—Extremely or very hard when dry
Electrical conductivity—1 to 8 mmhos/cm
Sodium adsorption ratio—10 to 20; pedons with sodium adsorption ratio of less than 13 have more exchangeable magnesium plus sodium than calcium plus exchange acidity at pH 8.2.
Reaction—pH 7.4 to 9.0

Btn2 horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay, silty clay, or silty clay loam
Clay content—35 to 55 percent
Content of rock fragments—0 to 10 percent pebbles
Structure—Fine to coarse prismatic or medium or coarse blocky
Hardness—Extremely or very hard when dry
Electrical conductivity—1 to 8 mmhos/cm
Sodium adsorption ratio—10 to 20; pedons with sodium adsorption ratio of less than 13 have more exchangeable magnesium plus sodium than calcium plus exchange acidity at pH 8.2
Reaction—pH 7.4 to 9.0

Bknyz horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Clay loam, sandy clay loam, clay, or silty clay
Clay content—30 to 50 percent
Content of rock fragments—0 to 10 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—8 to 16 mmhos/cm
Sodium adsorption ratio—13 to 30
Gypsum—1 to 5 percent
Reaction—pH 7.9 to 9.0

402A—Gerdrum-Absher-Creed complex, 0 to 2 percent slopes

Setting

Landform: Gerdrum—stream terraces; Absher—stream terraces; Creed—stream terraces
Position on landform: Gerdrum—microlows; Absher—microlows; Creed—microhighs
Slope: Gerdrum—0 to 2 percent; Absher—0 to 2 percent; Creed—0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Gerdrum and similar soils: 40 percent
Absher and similar soils: 25 percent
Creed and similar soils: 20 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Hillon and similar soils: 0 to 6 percent
Soils that have slopes more than 2 percent: 0 to 2 percent
Soils that have sandy layers below 40 inches: 0 to 6 percent

Major Component Description

Gerdrum

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.0 inches

Absher

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 3.9 inches

Creed

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches
Available water capacity: About 6.6 inches

Glendive Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-loamy, mixed (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Glendive fine sandy loam, 0 to 2 percent slopes, rarely flooded, in an area of rangeland; 2,100 feet north and 1,600 feet east of the southwest corner of sec. 29, T. 31 N., R. 14 E.

A—0 to 6 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; neutral; clear smooth boundary.

C1—6 to 12 inches; grayish brown (10YR 5/2) stratified loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—12 to 60 inches; light brownish gray (2.5Y 6/2) stratified fine sandy loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 8 and 24 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher
Soil phases: Flooded or sandy surface

A horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, or 6 dry; 3, 4, or 5 moist
Chroma—2 or 3
Clay content—5 to 15 percent
Reaction—pH 6.6 to 8.4

C horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam, silt loam, sandy loam, or fine sandy loam
Clay content—5 to 18 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 7.4 to 8.4

81A—Glendive fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Glendive and similar soils: 85 percent

Minor Components

Glendive, occasionally flooded: 0 to 2 percent
Hanly and similar soils: 0 to 2 percent
Havre and similar soils: 0 to 3 percent
Glendive, calcareous soils: 0 to 5 percent
Soils that have slopes more than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: About 7.6 inches

812A—Glendive fine sandy loam, calcareous, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Glendive and similar soils: 85 percent

Minor Components

Glendive, occasionally flooded: 0 to 2 percent
Hanly and similar soils: 0 to 2 percent
Glendive loam soils: 0 to 9 percent
Soils that have slopes more than 2 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: About 8.1 inches

Hanly Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Sandy, mixed, frigid Aridic Ustifluvents

Typical Pedon

Hanly loamy fine sand, 0 to 2 percent slopes, in an area of cropland; 500 feet north and 5,000 feet east of the southwest corner of sec. 36, T. 31 N., R. 16 E.

Ap—0 to 7 inches; light brownish gray (2.5Y 6/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; neutral; abrupt smooth boundary.
C1—7 to 17 inches; light brownish gray (2.5Y 6/2) stratified loamy fine sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots, few very fine pores; slightly effervescent; mildly alkaline; clear wavy boundary.
C2—17 to 44 inches; light brownish gray (2.5Y 6/2) stratified loamy fine sand with thin layers of fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; hard, very friable, nonsticky and nonplastic; few very fine roots, few very fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.
C3—44 to 60 inches; grayish brown (2.5Y 5/2) stratified fine sandy loam and loamy fine sand, dark grayish brown (2.5Y 4/2) moist; massive; hard, very friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Ap horizon
Hue—2.5Y or 10YR
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Clay content—5 to 10 percent
Reaction—ph 6.6 to 8.4

C horizon
Hue—10YR, 2.5Y, or 5YR
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 to 4
Clay content—5 to 10 percent
Reaction—ph 6.6 to 8.4

24A—Hanly loamy fine sand, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Hanly and similar soils: 85 percent

Minor Components

Hanly fine sand: 0 to 5 percent
Glendive, calcareous soils: 0 to 4 percent
Hanly, occasionally flooded: 0 to 2 percent
Soils that have slopes more than 2 percent: 0 to 4 percent

Major Component Description

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: About 5.7 inches

241A—Hanly loamy fine sand, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Hanly and similar soils: 85 percent

Minor Components

Somewhat poorly drained soils: 0 to 1 percent
Hanly fine sandy loam: 0 to 5 percent
Hanly, rarely flooded: 0 to 3 percent
Hanly, frequently flooded: 0 to 2 percent
Soils that have slopes more than 2 percent: 0 to 2 percent
Glendive, calcareous soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Occasional
Available water capacity: About 5.7 inches

Harlake Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Harlake clay, 0 to 2 percent slopes, in an area of cropland; 2,400 feet north and 800 feet west of the southeast corner of sec. 4, T. 32 N., R. 17 E.

Ap—0 to 10 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; common very fine roots; neutral; abrupt smooth boundary.
C1—10 to 32 inches; light brownish gray (2.5Y 6/2) stratified clay and clay loam, dark grayish brown (2.5Y 5/2) moist; massive; very hard, firm, very sticky and very plastic; few very fine roots, few very fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.
C2—32 to 60 inches; light brownish gray (2.5Y 6/2) stratified clay and clay loam, grayish brown (10YR 5/2) moist; massive; very hard, firm, very sticky and very plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches

Ap horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Clay loam or clay
Clay content—27 to 55 percent
Reaction—pH 6.6 to 8.4

C1 horizon
Hue—10YR, 2.5Y, or 5Y

Value—4, 5, 6, or 7 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Clay, silty clay, or silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay
Clay content—35 to 60 percent
Reaction—pH 7.4 to 8.4

C2 horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, 6, or 7 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Clay, silty clay, or silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay
Clay content—35 to 60 percent
Reaction—pH 7.4 to 9.0

90A—Harlake clay, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Harlake and similar soils: 85 percent

Minor Components

Harlake, calcareous soils: 0 to 10 percent
Havre, occasionally flooded: 0 to 2 percent
Soils that have slopes more than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: About 9.6 inches

Havre Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Havre loam, 0 to 2 percent slopes, in an area of rangeland; 2,300 feet north and 700 feet west of the southeast corner of sec. 18, T. 37 N., R. 16 E.

A—0 to 5 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and plastic; many very fine roots and few fine roots; neutral; clear smooth boundary.
C1—5 to 31 inches; grayish brown (2.5Y 5/2) stratified loam and fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, slightly sticky and plastic; many very fine roots; many very fine pores; slightly effervescent; moderately alkaline; clear wavy boundary.
C2—31 to 55 inches; grayish brown (2.5Y 5/2) stratified fine sandy loam and loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.
C3—55 to 60 inches; grayish brown (2.5Y 5/2) stratified fine sandy loam and clay loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Ap horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist

Chroma—2 or 3
Texture—Loam or clay loam
Clay content—15 to 40 percent
Effervescence—None to strong
Reaction—pH 6.1 to 8.4

C1 horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Loam, silt loam, or clay loam which consist of strata of silt loam, fine sandy loam, silty clay loam, and clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—1 to 10 percent
Effervescence—Slight or strong
Reaction—pH 7.4 to 8.4

C2 and C3 horizons
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Loam, silt loam, or clay loam which consist of strata of silt loam, fine sandy loam, silty clay loam, and clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—1 to 10 percent
Effervescence—Slight or strong
Reaction—pH 7.4 to 8.4

60A—Havre loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Havre and similar soils: 85 percent

Minor Components

Havre, calcareous soils: 0 to 9 percent
Glendive and similar soils: 0 to 2 percent
Havre, occasionally flooded: 0 to 1 percent
Soils that have slopes more than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: About 9.7 inches

604A—Havre-Glendive complex, 0 to 2 percent slopes

Setting

Landform: Havre—flood plains; Glendive—flood plains (fig. 4)
Slope: Havre—0 to 2 percent; Glendive—0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Havre and similar soils: 45 percent
Glendive and similar soils: 40 percent

Minor Components

Somewhat poorly drained soils: 0 to 1 percent
Harlake and similar soils: 0 to 3 percent
Havre, calcareous soils: 0 to 6 percent
Havre, frequently flooded: 0 to 1 percent
Glendive, rarely flooded: 0 to 2 percent
Soils that have slopes more than 2 percent: 0 to 2 percent

Major Component Description

Havre

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: About 9.7 inches

Glendive

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: About 7.2 inches

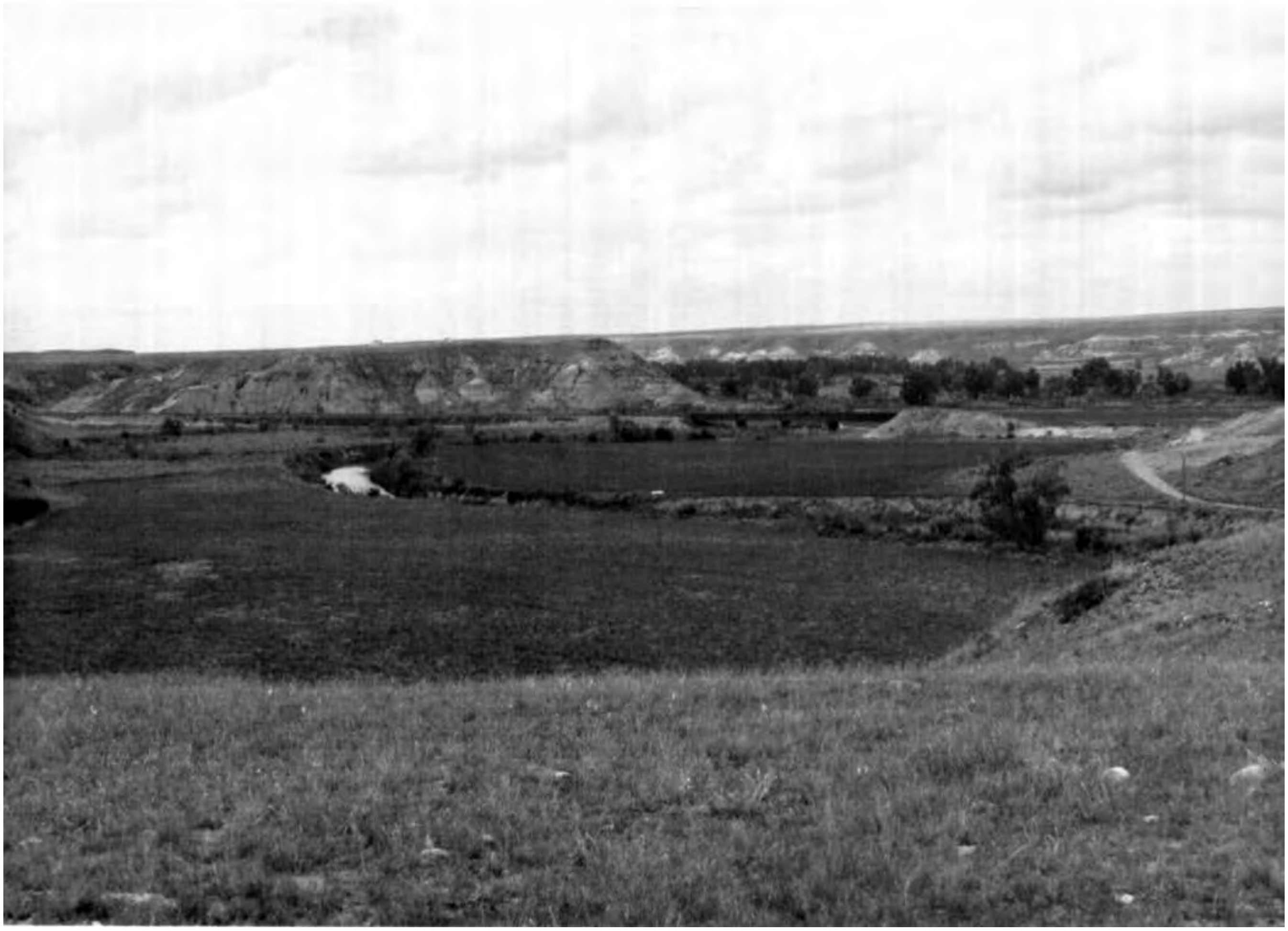

Figure 4.—Map unit 604A, Havre-Glendive complex, 0 to 2 percent slopes along the Milk River flood plain. Map unit 212F, Cabbart-Hillon loams, 25 to 60 percent slopes, surrounds this unit.

603A—Havre-Harlake clay loams, 0 to 2 percent slopes

Setting

Landform: Havre—flood plains; Harlake—flood plains
Slope: Havre—0 to 2 percent; Harlake—0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Havre and similar soils: 45 percent
Harlake and similar soils: 40 percent

Minor Components

Havre, occasionally flooded: 0 to 2 percent
Havre loam: 0 to 11 percent
Soils that have slopes more than 2 percent: 0 to 2 percent

Major Component Description

Havre

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: About 9.6 inches

Harlake

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: About 9.6 inches

Hedoes Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate in the upper 0 to 34 inches (0.6 to 2.0 inches/hour); moderately rapid below this depth (2.0 to 6.0 inches/hour)
Landform: Hills
Parent material: Colluvium
Slope range: 4 to 35 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 100 days

Taxonomic Class: Coarse-loamy, mixed Pachic Haploborolls

Typical Pedon

Hedoes loam, in an area of Hedoes-Belain loams, 15 to 35 percent slopes, in rangeland; 1,000 feet north and 2,250 feet west of the southeast corner of sec. 20, T. 28 N., R. 15 E.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine pores; neutral; clear smooth boundary.

Bw1—5 to 10 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine pores; neutral; clear wavy boundary.

Bw2—10 to 14 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many fine and common coarse roots; many fine pores; neutral; clear wavy boundary.

Bw3—14 to 18 inches; brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; weak moderate subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many fine pores; neutral; gradual wavy boundary.

Bw4—18 to 34 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine roots; common fine pores; neutral; clear wavy boundary.

2C—34 to 60 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; loose; very friable, nonsticky and nonplastic; few fine roots; common fine and coarse pores; 40 percent pebbles; mildly alkaline.

Range in Characteristics

Mollic epipedon thickness: 16 to 20 inches

A horizon
Hue—7.5YR, 10YR, or 2.5Y
Value—4 or 5 dry; 2 or 3 moist
Chroma—2 or 3
Clay content—10 to 15 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Reaction—pH 6.6 to 7.3

Bw horizon
Hue—7.5YR, 10YR, or 2.5Y
Value—4 or 5 dry; 2, 3, or 4 moist
Chroma—2 or 3
Texture—Loam or sandy loam
Clay content—5 to 15 percent
Content of rock fragments—0 to 20 percent—0 to 10 percent cobbles, 0 to 10 percent pebbles
Reaction—pH 6.6 to 8.4
Other features—Some pedons have a cambic C horizon

2C horizon
Hue—7.5YR, 10YR, or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Sandy loam or coarse sandy loam
Clay content—0 to 10 percent
Content of rock fragments—30 to 60 percent
Reaction—pH 7.4 to 8.4

761D—Hedoes-Belain loams, 4 to 15 percent slopes

Setting

Landform: Hedoes—hills; Belain—hills
Position on landform: Hedoes—back slopes; Belain—shoulders
Slope: Hedoes—4 to 15 percent; Belain—4 to 15 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Hedoes and similar soils: 50 percent
Belain and similar soils: 35 percent

Minor Components

Bowery and similar soils: 0 to 5 percent
Whitlash and similar soils: 0 to 3 percent
Farnuf and similar soils: 0 to 3 percent
Soils with salts: 0 to 1 percent
Soils that have slopes less than 4 percent: 0 to 2 percent
Soils that have slopes more than 15 percent: 0 to 1 percent

Major Component Description

Hedoes

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 7.1 inches

Belain

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.5 inches

761F—Hedoes-Belain loams, 15 to 35 percent slopes

Setting

Landform: Hedoes—hills; Belain—hills
Position on landform: Hedoes—back slopes; Belain—shoulders
Slope: Hedoes—15 to 35 percent; Belain—15 to 35 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Hedoes and similar soils: 45 percent
Belain and similar soils: 40 percent

Minor Components

Bowery and similar soils: 0 to 5 percent
Whitlash and similar soils: 0 to 5 percent
Soils that have slopes less than 15 percent: 0 to 2 percent
Soils that have slopes more than 35 percent: 0 to 2 percent
Areas of rock outcrop: 0 to 1 percent

Major Component Description

Hedoes

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 7.1 inches

Belain

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.5 inches

Hillon Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains and hills
Parent material: Glacial till
Slope range: 0 to 70 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents

Typical Pedon

Hillon loam, in an area of Hillon-Joplin loams, 8 to 15 percent slopes, in rangeland; 2,200 feet south and 500 feet west of the northeast corner of sec. 32, T. 32 N., R. 15 E.

Ap—0 to 3 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate very fine granular structure; slightly hard, very friable, slightly sticky and plastic; many

very fine and common fine roots; common very fine pores; mildly alkaline; clear smooth boundary.

Bk1—3 to 16 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable, sticky and plastic; many very fine and common fine roots; many very fine pores; many fine and medium soft masses of lime; violently effervescent; strongly alkaline; clear wavy boundary.

Bk2—16 to 29 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; common very fine pores; common fine and medium soft masses of lime; violently effervescent; strongly alkaline; clear wavy boundary.

By—29 to 60 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots in upper part; few very fine pores; common fine and medium seams and masses of gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

Ap horizon

Hue—10YR or 2.5Y
Value—5 or 6 dry; 3, 4, or 5 moist
Chroma—2 or 3
Texture—Loam or clay loam
Clay content—20 to 35 percent
Content of rock fragments—0 to 25 percent—0 to 10 percent cobbles and stones, 0 to 15 percent pebbles
Calcium carbonate equivalent—0 to 10 percent
Effervescence—None to violent
Reaction—pH 7.4 to 8.4

Bk horizon

Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—20 to 35 percent with 25 to 35 percent fine and coarser sand
Content of rock fragments—0 to 15 percent pebbles
Bulk density—1.55 to 1.75 g/ccm
Calcium carbonate equivalent—5 to 15 percent
Effervescence—Strong or violent
Reaction—pH 7.9 to 9.0

By horizon

Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—20 to 35 percent with 25 to 35 percent fine and coarser sand
Content of rock fragments—0 to 15 percent pebbles
Bulk density—1.55 to 1.75 g/ccm
Calcium carbonate equivalent—2 to 12 percent
Effervescence—Strong to violent
Reaction—pH 7.9 to 9.0

22E—Hillon loam, 15 to 25 percent slopes

Setting

Landform: Hills
Slope: 15 to 25 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Hillon and similar soils: 85 percent

Minor Components

Chinook and similar soils: 0 to 2 percent
Delpoint, calcareous soils: 0 to 3 percent
Hillon clay loam: 0 to 7 percent
Marias and similar soils: 0 to 1 percent
Soils that have slopes more than 25 percent: 0 to 1 percent
Soils that have slopes less than 15 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.0 inches

22F—Hillon loam, 25 to 60 percent slopes

Setting

Landform: Hills
Slope: 25 to 60 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Hillon and similar soils: 85 percent

Minor Components

Havre, occasionally flooded: 0 to 1 percent
Delpoint, calcareous soils: 0 to 2 percent
Tinsley and similar soils: 0 to 3 percent
Chinook and similar soils: 0 to 6 percent
Soils that have slopes less than 25 percent: 0 to 2 percent
Area of rock outcrop: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.0 inches

968D—Hillon-Fortbenton complex, 8 to 25 percent slopes

Setting

Landform: Hillon—hills; Fortbenton—hills
Position on landform: Hillon—shoulders; Fortbenton—back slopes
Slope: Hillon—8 to 25 percent; Fortbenton—8 to 25 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Hillon and similar soils: 45 percent
Fortbenton and similar soils: 40 percent

Minor Components

Chinook and similar soils: 0 to 8 percent
Busby and similar soils: 0 to 3 percent
Hillon gravelly loam: 0 to 2 percent
Soils that have slopes more than 25 percent: 0 to 1 percent
Soils that have slopes less than 8 percent: 0 to 1 percent

Major Component Description

Hillon

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.0 inches

Fortbenton

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

224D—Hillon-Joplin loams, 8 to 15 percent slopes

Setting

Landform: Hillon—hills; Joplin—hills
Position on landform: Hillon—shoulders; Joplin—back slopes
Slope: Hillon—8 to 15 percent; Joplin—8 to 15 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Hillon and similar soils: 50 percent
Joplin and similar soils: 35 percent

Minor Components

Kevin and similar soils: 0 to 5 percent
Fortbenton and similar soils: 0 to 3 percent

Chinook and similar soils: 0 to 2 percent
Soils that have slopes more than 15 percent: 0 to 1 percent
Soils that have slopes less than 8 percent: 0 to 2 percent
Hillon gravelly loam: 0 to 2 percent

Major Component Description

Hillon

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.0 inches

Joplin

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.2 inches

221D—Hillon-Kevin clay loams, 8 to 15 percent slopes

Setting

Landform: Hillon—hills; Kevin—hills
Position on landform: Hillon—shoulders; Kevin—back slopes
Slope: Hillon—8 to 15 percent; Kevin—8 to 15 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Hillon and similar soils: 50 percent
Kevin and similar soils: 35 percent

Minor Components

Joplin and similar soils: 0 to 5 percent
Fortbenton and similar soils: 0 to 1 percent
Scobey and similar soils: 0 to 4 percent
Soils that have slopes more than 15 percent: 0 to 1 percent
Soils that have slopes less than 8 percent: 0 to 2 percent
Hillon gravelly loam: 0 to 2 percent

Major Component Description

Hillon

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.9 inches

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Hingham Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Lake plains
Parent material: Glaciolacustrine deposits
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-silty, mixed Aridic Haploborolls

Typical Pedon

Hingham loam, in an area of Hingham-Lonna loams, 0 to 4 percent slopes, in an area of cropland; 500 feet north and 1,000 feet west of the southeast corner of sec. 21, T. 32 N., R. 11 E.

Ap—0 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak very fine granular structure; soft, very friable, sticky and slightly plastic; many very fine roots; common very fine pores; neutral; abrupt smooth boundary.
Bw—7 to 14 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, sticky and slightly plastic; many very fine roots; many very fine pores; neutral; clear smooth boundary.
Bk1—14 to 22 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; moderate fine and medium subangular blocky

structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; few fine soft seams of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—22 to 35 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine pores; few fine soft seams of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—35 to 60 inches; light brownish gray (2.5Y 6/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine pores; few fine soft seams of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in some part six-tenths or more of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher
Mollic epipedon thickness: 7 to 10 inches
Depth to Bk horizon: 10 to 16 inches

Ap horizon
Hue—10YR or 2.5Y
Value—2 or 3 moist
Chroma—2 or 3
Clay content—7 to 18 percent
Reaction—pH 6.1 to 7.8

Bw horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 3 or 4 moist
Chroma—2, 3, or 4
Texture—Silt loam, loam, or very fine sandy loam
Clay content—5 to 18 percent
Reaction—pH 6.1 to 7.8

Bk horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Silt loam or very fine sandy loam
Clay content—5 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.9 to 8.4

611B—Hingham-Lonna loams, 0 to 4 percent slopes

Setting

Landform: Hingham—lake plains; Lonna—lake plains
Position on landform: Hingham—foot slopes; Lonna—back slopes
Slope: Hingham—0 to 4 percent; Lonna—0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Hingham and similar soils: 50 percent
Lonna and similar soils: 35 percent

Minor Components

Kremlin and similar soils: 0 to 2 percent
Chinook and similar soils: 0 to 8 percent
Hingham very fine sandy loam: 0 to 2 percent
Soils that have slopes more than 4 percent: 0 to 3 percent

Major Component Description

Hingham

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.2 inches

Lonna

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Joplin Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains and hills
Parent material: Glacial till
Slope range: 0 to 15 percent

Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Joplin loam, in an area of Joplin-Hillon loams, 2 to 8 percent slopes, in cropland; 800 feet south and 500 feet east of the northwest corner of sec. 24, T. 35 N., R. 15 E.

Ap—0 to 5 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine granular structure; sightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; mildly alkaline; abrupt smooth boundary.

Bt—5 to 9 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common fine and very fine roots; common fine pores; common distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bk—9 to 26 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots; common very fine pores; common medium soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bky—26 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine pores; common soft masses of lime; few fine masses of gypsum; violently effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 9 inches
Depth to the Bk horizon: Less than 10 inches
Depth to the Bky horizon: 26 to 60 inches

Ap horizon
Hue—10YR or 2.5Y
Chroma—2 or 3
Clay content—10 to 27 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Calcium carbonate equivalent—0 to 5 percent
Reaction—pH 6.6 to 8.4

Bt horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Loam or clay loam
Clay content—25 to 35 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.6 to 8.4

Bk horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Loam or clay loam
Clay content—18 to 32 percent
Content of rock fragments—0 to 35 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.4 to 8.4

Bky horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Loam or clay loam
Clay content—18 to 32 percent
Content of rock fragments—0 to 35 percent pebbles
Bulk density—1.6 to 1.8 gr/cm
Reaction—pH 7.4 to 8.4

421C—Joplin-Hillon loams, 2 to 8 percent slopes

Setting

Landform: Joplin—till plains; Hillon—till plains
Position on landform: Joplin—back slopes; Hillon—shoulders
Slope: Joplin—2 to 8 percent; Hillon—2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Joplin and similar soils: 50 percent
Hillon and similar soils: 35 percent

Minor Components

Kevin and similar soils: 0 to 9 percent
Fortbenton and similar soils: 0 to 3 percent

Chinook and similar soils: 0 to 1 percent
Soils that have slopes more than 8 percent: 0 to 2 percent

Major Component Description

Joplin

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.2 inches

Hillon

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.0 inches

Kenilworth Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Glaciofluvial deposits
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Kenilworth fine sandy loam, in an area of Kenilworth-Fortbenton fine sandy loams, 0 to 4 percent slopes, in cropland; 2,640 feet south and 50 feet west of the northeast corner of sec. 20, T. 36 N., R. 13 E.

Ap—0 to 8 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; many very fine roots; few fine pores; neutral; abrupt smooth boundary.

Bt—8 to 16 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; common distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

2Bk1—16 to 26 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; hard, firm, sticky and plastic; few very fine roots; few very fine pores; common fine soft masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

2Bk2—26 to 34 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine pores; many fine and medium soft masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

2Bk3—34 to 48 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine pores; common fine and medium soft masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

2Bky—48 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few very fine roots; few very fine pores; few fine soft masses of lime; common fine soft masses of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches
Depth to the Bk horizon: 10 to 26 inches

Ap horizon
Value—4 or 5 dry; 2 or 3 moist
Chroma—2 or 3
Clay content—5 to 18 percent
Reaction—pH 6.6 to 7.8

Bt horizon
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Fine sandy loam or sandy clay loam
Clay content—15 to 30 percent and more than 45 percent fine and coarser sand
Reaction—pH 6.6 to 7.8

2Bk horizon
- Hue—10YR or 2.5Y
- Value—5 or 6 dry; 4 or 5 moist
- Chroma—2, 3, or 4
- Texture—Clay loam or silty clay loam
- Clay content—27 to 35 percent
- Content of rock fragments—0 to 5 percent pebbles
- Calcium carbonate equivalent—5 to 15 percent
- Reaction—pH 7.4 to 9.0

951B—Kenilworth-Fortbenton fine sandy loams, 0 to 4 percent slopes

Setting

Landform: Kenilworth—till plains; Fortbenton—till plains
Slope: Kenilworth—0 to 4 percent; Fortbenton—0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Kenilworth and similar soils: 60 percent
Fortbenton and similar soils: 25 percent

Minor Components

Fortbenton loam soils: 0 to 3 percent
Hillon and similar soils: 0 to 3 percent
Evanston and similar soils: 0 to 8 percent
Soils that have slopes more than 4 percent: 0 to 1 percent

Major Component Description

Kenilworth

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.2 inches

Fortbenton

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Kevin Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains and hills
Parent material: Glacial till
Slope range: 0 to 15 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Kevin clay loam, in an area of Scobey-Kevin clay loams, 0 to 4 percent slopes, in cropland; 1,700 feet south and 2,100 feet west of the northeast corner of sec. 9, T. 30 N., R. 13 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine pores; mildly alkaline; abrupt smooth boundary.

Bt—6 to 9 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; moderate fine and medium prismatic structure parting to strong fine subangular blocky; hard, firm, sticky and plastic; few very fine roots; few very fine pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bk1—9 to 26 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; many very fine pores; many fine soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—26 to 47 inches; light yellowish brown (10YR 6/4) clay loam, light olive brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, sticky and plastic; few very fine roots; many very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bky—47 to 60 inches; dark grayish brown (2.5Y 4/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky and very plastic; few very fine roots; common very fine pores; few fine soft masses of lime; common fine

masses of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 12 inches
Depth to the Bk horizon: Less than 10 inches

Ap horizon
Hue—10YR, 2.5Y, or 5Y
Chroma—2 or 3
Clay content—27 to 32 percent
Content of rock fragments—0 to 15 percent—0 to 10 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 6.6 to 7.8

Bt horizon
Hue—10YR, 2.5Y, or 5Y
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Clay loam or clay
Clay content—35 to 45 percent
Content of rock fragments—0 to 15 percent
Reaction—pH 6.6 to 8.4

Bk horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Clay content—27 to 35 percent
Content of rock fragments—0 to 15 percent pebbles
Bulk density—1.6 to 1.8 gram/cm
Calcium carbonate equivalent—.5 to 15 percent
Reaction—pH 7.4 to 8.4

Bky horizon
Hue—10YR, 5Y, or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Clay content—27 to 35 percent
Content of rock fragments—0 to 15 percent
Bulk density—1.6 to 1.8 gram/cm
Calcium carbonate equivalent—1 to 10 percent
Gypsum—0 to 2 percent
Reaction—pH 7.9 to 9.0

442C—Kevin-Elloam clay loams, 2 to 8 percent slopes

Setting

Landform: Kevin—till plains; Elloam—till plains
Position on landform: Kevin—back slopes and shoulders; Elloam—back slopes
Slope: Kevin—2 to 8 percent; Elloam—2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Kevin and similar soils: 60 percent
Elloam and similar soils: 25 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Absher and similar soils: 0 to 2 percent
Phillips and similar soils: 0 to 3 percent
Hillon and similar soils: 0 to 5 percent
Soils that have slopes more than 8 percent: 0 to 1 percent
Kevin gravelly loam: 0 to 3 percent

Major Component Description

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Elloam

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.5 inches

441C—Kevin-Hillon clay loams, 2 to 8 percent slopes

Setting

Landform: Kevin—till plains; Hillon—till plains
Position on landform: Kevin—back slopes; Hillon—shoulders
Slope: Kevin—2 to 8 percent; Hillon—2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Kevin and similar soils: 50 percent

Hillon and similar soils: 35 percent

Minor Components

Joplin and similar soils: 0 to 9 percent
Marias and similar soils: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Hillon

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.9 inches

Kobase Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Lake plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic, frigid Aridic Ustochrepts

Typical Pedon

Kobase clay loam, 0 to 2 percent slopes, in an area of cropland; 1,500 feet south and 1,300 feet east of the northwest corner of sec. 11, T. 31 N., R. 14 E.

Ap—0 to 5 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; strong fine granular structure; slightly hard, firm, sticky and very plastic; common very fine roots; many very fine pores; neutral; clear smooth boundary.

Bw—5 to 12 inches; dark grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to strong fine subangular blocky; very hard, firm, sticky and very plastic; common very fine roots; many very fine pores; neutral; abrupt smooth boundary.

Bk1—12 to 19 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; extremely hard, firm, sticky and very plastic; few very fine roots; many very fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—19 to 34 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure; hard, firm, sticky and plastic; few very fine roots; common very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—34 to 40 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium prismatic structure; extremely hard, firm, sticky and plastic; few very fine roots; common very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bky—40 to 60 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak fine prismatic structure; extremely hard, firm, sticky and plastic; few very fine roots; common very fine pores; few fine soft masses of lime; few fine masses of gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches
Depth to Bk horizon: 12 to 17 inches
Soil phases: Calcareous

Ap horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Clay content—27 to 40 percent
Content of rock fragments—0 to 5 percent pebbles
Electrical conductivity—0 to 2 mmhos/cm
Reaction—pH 6.6 to 8.4

Bw horizon
Hue—10YR, 2.5Y, or 5Y

Value—5 or 6 dry; 4 or 5 moist
Chroma—1, 2, 3, or 4
Texture—Silty clay loam, silty clay, or clay
Clay content—35 to 45 percent
Content of rock fragments—0 to 5 percent pebbles
Reaction—pH 7.4 to 8.4

Bk1 horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—1, 2, 3, or 4
Texture—Silty clay loam, silty clay, or clay
Clay content—35 to 45 percent
Content of rock fragments—0 to 5 percent pebbles
Calcium carbonate equivalent—5 to 10 percent
Reaction—pH 7.4 to 8.4

Bk2 and Bk3 horizons
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Silty clay loam, silty clay, or clay
Clay content—35 to 45 percent
Content of rock fragments—0 to 5 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.9 to 8.4

Bky horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—1, 2, 3, or 4
Texture—Silty clay loam, silty clay, or clay
Clay content—35 to 45 percent
Content of rock fragments—0 to 5 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Gypsum—1 to 5 percent
Reaction—pH 7.9 to 9.0

32A—Kobase clay loam, 0 to 2 percent slopes

Setting

Landform: Lake plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Kobase and similar soils: 85 percent

Minor Components

Dimmick and similar soils: 0 to 1 percent
Ethridge and similar soils: 0 to 5 percent
Kobase, calcareous soils: 0 to 1 percent
Marias and similar soils: 0 to 6 percent
Cozberg and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

321A—Kobase clay loam, calcareous, 0 to 2 percent slopes

Setting

Landform: Lake plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Kobase and similar soils: 85 percent

Minor Components

McKenzie and similar soils: 0 to 1 percent
Marias and similar soils: 0 to 5 percent
Yamacall, calcareous soils: 0 to 6 percent
Soils that have sandy layers below 40 inches: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

Korchea Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains

Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 70 to 100 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Mollic Ustifluvents

Typical Pedon

Korchea loam, in an area of Straw-Korchea loams, 0 to 2 percent slopes, in cropland; 1,000 feet north and 1,000 feet east of the southwest corner of sec. 36, T. 32 N., R. 15 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine pores; neutral; abrupt smooth boundary.

C1—6 to 13 inches; grayish brown (10YR 5/2) stratified fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—13 to 22 inches; light brownish gray (10YR 6/2) stratified loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—22 to 60 inches; light brownish gray (10YR 6/2) stratified loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots, common very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Ap horizon
Hue—10YR or 2.5Y
Value—3, 4, or 5 dry; 2 or 3 moist
Chroma—2 or 3
Clay content—18 to 27 percent
Reaction—pH 6.6 to 8.4.

C horizon
Hue—2.5Y or 10YR, but 5Y is in the range
Value—4, 5, 6, or 7 dry; 3, 4, 5, or 6 moist
Chroma—2 to 4
Texture—Loam, silt loam, silty clay loam, clay loam, fine sandy loam, sandy loam, or very fine sandy loam
Clay content—18 to 35 percent
Reaction—pH 7.4 to 8.4

Kremlin Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed Aridic Haploborolls

Typical Pedon

Kremlin loam, 0 to 4 percent slopes, in an area of cropland; 1,000 feet south and 1,700 feet east of the northwest corner of sec. 23, T. 30 N., R. 10 E.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate fine granular structure; soft, very friable, sticky and plastic; many very fine roots; neutral; abrupt smooth boundary.

Bw1—6 to 11 inches; dark grayish brown (2.5Y 4/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, very friable, sticky and plastic; many very fine roots; many very fine pores; neutral; clear smooth boundary.

Bw2—11 to 19 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, sticky and plastic; many very fine roots; many very fine pores; neutral; clear smooth boundary.

Bk1—19 to 31 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; many very fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—31 to 60 inches; light yellowish brown (2.5Y 6/4) loam, grayish brown (2.5Y 5/2) moist; weak fine

subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in some part six-tenths or more of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher
Mollic epipedon thickness: 7 to 15 inches; in some pedons it includes all or only the upper part of the Bw1 horizon
Depth to Bk horizon: 10 to 24 inches

Ap horizon
Hue—10YR or 2.5Y
Value—2 or 3 moist
Chroma—2 or 3
Clay content—18 to 27 percent
Content of rock fragments—0 to 5 percent pebbles
Reaction—pH 6.1 to 7.8

Bw horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Loam, silt loam, clay loam, or sandy clay loam
Clay content—18 to 32 percent
Content of rock fragments—0 to 5 percent pebbles
Reaction—pH 6.6 to 7.8

Bk1 horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Texture—Loam, silt loam, clay loam, or sandy clay loam
Clay content—18 to 30 percent
Content of rock fragments—0 to 5 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Effervescence—Strong or violent
Electrical conductivity—0 to 2 mmhos/cm
Reaction—pH 7.4 to 8.4

Bk2 horizon
Hue—10YR, 2.5Y, or 5Y
Value—6, 7, or 8 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Clay content—10 to 25 percent
Content of rock fragments—0 to 5 percent pebbles
Calcium carbonate equivalent—3 to 12 percent
Effervescence—Strong or violent
Electrical conductivity—0 to 4 mmhos/cm
Reaction—pH 7.4 to 8.4

98B—Kremlin loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Kremlin and similar soils: 85 percent

Minor Components

Yamacall, calcareous soils: 0 to 2 percent
Fortbenton and similar soils: 0 to 1 percent
Kremlin clay loam: 0 to 8 percent
Cozberg and similar soils: 0 to 3 percent
Soils that have slopes more than 4 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.2 inches

Laceycreek Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate in the upper 0 to 42 inches (0.6 to 2.0 inches/hour); moderately rapid below this depth (2.0 to 6.0 inches/hour)
Landform: Alluvial fans, drainageways
Parent material: Alluvium
Slope range: 8 to 25 percent
Annual precipitation: 15 to 19 inches

Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 100 days

Taxonomic Class: Fine-loamy, mixed Pachic Udic Haploborolls

Typical Pedon

Laceycreek loam, in an area of Laceycreek loam, moist, 8 to 25 percent slopes, in woodland; 2,300 feet north and 200 feet east of the southwest corner of sec. 28, T. 29 N., R. 16 E.

A1—0 to 18 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; strong very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; and few medium and coarse roots; many very fine pores; neutral; clear smooth boundary.

A2—18 to 23 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; many fine and very fine roots; common fine and very fine pores; neutral; clear wavy boundary.

Bt1—23 to 30 inches; dark brown (10YR 3/3) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; common fine and very fine roots; many fine and very fine pores; common faint clay films on faces of peds; neutral; gradual smooth boundary.

Bt2—30 to 42 inches; dark brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few fine and very fine roots; many very fine and few fine pores; common distinct clay films on faces of peds; neutral; abrupt wavy boundary.

2BC—42 to 60 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and few fine pores; 15 percent pebbles; neutral.

Range in Characteristics

Mollic epipedon thickness: 16 to 60 inches

A1 horizon
Hue—10YR, 2.5Y, or N
Value—3 or 4 dry; 2, 3, or N moist
Chroma—0 or 1
Clay content—15 to 24 percent
Content of rock fragments—0 to 15 percent—0 to 10 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 6.1 to 7.3

A2 horizon
Hue—10YR, 2.5Y, or N
Value—3 or 4 dry; 2 or 3 moist
Clay content—15 to 24 percent
Content of rock fragments—0 to 15 percent—0 to 10 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 6.1 to 7.3

Bt1 horizon
Hue—10YR or 2.5Y
Value—3, 4, or 5 dry; 3 moist
Chroma—2 or 3
Texture—Loam or clay loam
Clay content—24 to 35 percent
Content of rock fragments—0 to 10 percent—0 to 10 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 6.1 to 7.3

Bt2 horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Loam, clay loam, or sandy clay loam
Clay content—20 to 35 percent
Content of rock fragments—0 to 25 percent—0 to 20 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 6.6 to 7.3

2C horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Sandy loam or loam
Clay content—5 to 20 percent
Content of rock fragments—0 to 20 percent—0 to 15 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 6.6 to 7.3

110D—Laceycreek loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Laceycreek and similar soils: 85 percent

Minor Components

Farnuf and similar soils: 0 to 9 percent
Bowery and similar soils: 0 to 5 percent
Perma cobbly loam: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.0 inches

763E—Laceycreek loam, moist, 8 to 25 percent slopes

Setting

Landform: Drainageways
Slope: 8 to 25 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Laceycreek and similar soils: 85 percent

Minor Components

Eagleton and similar soils: 0 to 3 percent
Enbar and similar soils: 0 to 6 percent
Belain and similar soils: 0 to 2 percent
Straw and similar soils: 0 to 2 percent
Nesda and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: About 10.0 inches

Lonesome Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Rapid in the upper 0 to 30 inches (6.0 to 20.0 inches/hour); Slow below this depth (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Eolian deposits over glacial till or lacustrine material
Slope range: 0 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Sandy over loamy, mixed, frigid Aridic Ustorthents

Typical Pedon

Lonesome loamy fine sand, in an area of Yetull-Lonesome loamy fine sands, 0 to 8 percent slopes, in rangeland; 1,400 feet south and 1,400 feet west of the northeast corner of sec. 11, T. 36 N., R. 14 E.

A—0 to 5 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; many very fine roots; neutral; clear smooth boundary.

Bw—5 to 15 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; neutral; clear smooth boundary.

Bk1—15 to 30 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; few fine soft seams of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

2Bk2—30 to 51 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and plastic; common very fine roots; common very fine pores; common fine soft masses and seams of lime; violently effervescent; strongly alkaline; clear wavy boundary.

2Bk3—51 to 60 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; weak fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine pores; common fine soft masses of lime; violently effervescent; strongly alkaline.

Range in Characteristics

Depth to the Bk2 horizon: 20 to 40 inches

A horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry; 3 or 4 moist
Chroma—2, 3, or 4
Clay content—5 to 15 percent
Content of rock fragments—0 to 2 percent pebbles
Reaction—pH 6.6 to 7.8
Other features—Some pedons contain A2 horizons 3 to 6 inches thick which when combined with the A horizon meet all the requirements for a mollic epipedon except for organic matter content; the A2 horizon has a loamy fine sand, loamy sand, or fine sand texture

Bw horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 3, 4, or 5 moist
Chroma—3 or 4
Texture—Loamy fine sand, loamy sand, or fine sand
Clay content—5 to 15 percent
Content of rock fragments—0 to 2 percent
Reaction—pH 6.6 to 7.8

Bk1 horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 3, 4, or 5 moist
Chroma—3 or 4
Texture—Loamy fine sand, loamy sand, or fine sand
Clay content—5 to 15 percent
Content of rock fragments—0 to 2 percent
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.9 to 8.4

2Bk horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Clay loam, loam, or silty clay loam (contains less than 50 percent fine or coarser sand)
Clay content—20 to 35 percent
Content of rock fragments—0 to 5 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 4 mmhos/cm
Sodium adsorption ratio—0 to 13
Reaction—pH 7.9 to 9.0
Other features—Some pedons have a 2Bky horizon with 1 to 2 percent gypsum; some pedons have thin lenses of fine sandy loam or loam textures between thicker layers of loam or clay loam

Lonna Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Till plains and lake plains
Parent material: Alluvium and glaciolacustrine deposits
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-silty, mixed, frigid Aridic Ustochrepts

Typical Pedon

Lonna loam, in an area of Hingham-Lonna loams, 0 to 4 percent slopes, in cropland; 200 feet north and 2,100 feet west of the southeast corner of sec. 8, T. 31 N., R. 12 E.

Ap—0 to 6 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; weak medium and fine subangular blocky structure parting to weak very fine granular; soft, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—6 to 11 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—11 to 28 inches; pale brown (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; many fine soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—28 to 52 inches; light gray (2.5Y 7/2) silt loam, light yellowish brown (2.5Y 6/4) moist; moderate

very fine and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; common fine soft masses of lime; strongly effervescent; strongly alkaline.

BC—52 to 60 inches: light gray (2.5Y 7/2) very fine sandy loam, light yellowish brown (2.5Y 6/4) moist; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and slightly plastic; few very fine roots; common very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher
Depth to Bk horizon: 10 to 12 inches

Ap horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 3, 4, or 5 moist
Chroma—2, 3, or 4
Clay content—18 to 27 percent
Effervescence—Slight or strong
Calcium carbonate equivalent—5 to 10 percent
Reaction—pH 7.4 to 8.4

Bw horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Silt loam or silty clay loam
Clay content—18 to 35 percent
Effervescence—Slight or strong
Calcium carbonate equivalent—5 to 10 percent
Reaction—pH 7.4 to 8.4

Bk1 horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Silt loam or silty clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—2 to 8 mmhos/cm
Sodium adsorption ratio—1 to 13
Effervescence—Strong or violent
Reaction—pH 7.9 to 9.0

Bk2 horizon
Hue—10YR or 2.5Y
Value—5, 6, 7, or 8 dry; 4, 5, 6, or 7 moist
Chroma—2, 3, or 4
Texture—Silt loam or silty clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—2 to 8 mmhos/cm
Sodium adsorption ratio—1 to 13
Effervescence—Strong or violent
Reaction—pH 7.9 to 9.0

C horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Very fine sandy loam, loam, silt loam, or silty clay loam (may be stratified)
Clay content—10 to 35 percent
Electrical conductivity—2 to 16 mmhos/cm
Sodium adsorption ratio—10 to 30
Effervescence—Strong or violent
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.9 to 9.0

Lostriver Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Lostriver clay, 0 to 2 percent slopes, in an area of rangeland; 800 feet north and 800 feet east of the southwest corner of sec. 3, T. 35 N., R. 12 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak very fine granular structure; extremely hard, extremely firm, very sticky and very plastic; common very fine roots; many very fine pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C—3 to 9 inches; grayish brown (2.5Y 5/2) stratified clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, extremely firm, very sticky and very plastic; common very fine roots; common very fine pores; strongly effervescent; very strongly alkaline; abrupt wavy boundary.

Cyz—9 to 60 inches; grayish brown (2.5Y 5/2) clay consisting of thin strata of clay loam, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, extremely firm, very sticky and very plastic; few very fine roots; common very fine pores; common fine masses of gypsum and other salts; strongly effervescent; very strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at 20 inches is 41 degrees F or above

A horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, or 6 dry; 3, 4, or 5 moist
Chroma—2 or 3
Clay content—40 to 55 percent clay
Electrical conductivity—2 to 8 mmhos/cm
Sodium adsorption ratio—8 to 13
Calcium carbonate equivalent—0 to 10
Reaction—pH 7.4 to 9.4

C horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Clay loam, silty clay loam, clay, or silty clay with or without thin strata of loam, clay loam, or silty clay loam
Clay content—35 to 55 percent clay
Electrical conductivity—4 to 16 mmhos/cm
Sodium adsorption ratio—13 to 20
Calcium carbonate equivalent—5 to 10
Reaction—pH 7.4 to 9.6

Cyz horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 3, 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Clay loam, silty clay loam, clay, or silty clay with or without thin strata of loam, clay loam, or silty clay loam
Clay content—35 to 55 percent clay
Electrical conductivity—8 to 16 mmhos/cm
Sodium adsorption ratio—13 to 30
Gypsum—2 to 5 percent
Calcium carbonate equivalent—5 to 10
Reaction—pH 7.4 to 9.6
Other features—Gypsum and other salts are inherent in the parent material; some profiles have thin strata of sandy material below 40 inches

78A—Lostriver clay, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Lostriver and similar soils: 85 percent

Minor Components

Harlake and similar soils: 0 to 9 percent
Havre, occasionally flooded: 0 to 1 percent
Nobe and similar soils: 0 to 2 percent
Soils that have slopes more than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 8.5 inches

Macar Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Hills
Parent material: Colluvium
Slope range: 15 to 60 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 100 days

Taxonomic Class: Fine-loamy, mixed, frigid Typic Ustochrepts

Typical Pedon

Macar loam, in an area of Cabba-Macar loams, 15 to 60 percent slopes, in rangeland; 2,300 feet south and 950 feet east of the northwest corner of sec. 31, T. 29 N., R. 15 E.

A—0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure parting to moderate fine granular; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine pores; mildly alkaline; abrupt smooth boundary.

Bw—4 to 12 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many very fine and fine pores; mildly alkaline; abrupt wavy boundary.

Bk1—12 to 22 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; common fine pores; common medium soft masses of lime; strongly effervescent; mildly alkaline; clear wavy boundary.

Bk2—22 to 37 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine and fine roots; common fine pores; common medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—37 to 60 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine roots; few very fine pores; violently effervescent, moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches
Depth to the Bk horizon: 11 to 24 inches

Ap horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 3, 4, or 5 moist
Chroma—2 or 3
Clay content—18 to 27 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Electrical conductivity—0 to 2 mmhos/cm
Reaction—pH 6.6 to 8.4

Bw horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 3, 4, or 5 moist
Chroma—2, 3, 4, or 6
Texture—Loam, clay loam, or silty clay loam
Clay content—18 to 35 percent
Content of rock fragments—0 to 5 percent pebbles
Effervescence—None to slight
Electrical conductivity—0 to 2 mmhos/cm
Reaction—pH 6.6 to 8.4

Bk1 horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, 4, or 6
Texture—Clay loam, loam, or silty clay loam
Clay content—18 to 35 percent
Content of rock fragments—0 to 5 percent pebbles
Effervescence—Slight or strong
Calcium carbonate equivalent—8 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Reaction—pH 7.4 to 8.4

Bk2 horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, 4, or 6
Texture—Clay loam, loam, silt loam, sandy clay loam, or silty clay loam (some fine strata of sandy loam and fine sandy loam are in some pedons)
Clay content—18 to 35 percent with 35 to 55 percent fine sand and coarser
Content of rock fragments—0 to 10 percent pebbles
Effervescence—Strong or violent
Calcium carbonate equivalent—8 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Reaction—pH 7.4 to 8.4

C horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, 4, or 6
Texture—Loam, silt loam, or silty clay loam consisting of strata of very fine sandy loam, sandy clay loam, and silt loam
Clay content—15 to 30 percent

Content of rock fragments—0 to 10 percent pebbles
Effervescence—Strong or violent
Calcium carbonate equivalent—5 to 12 percent
Electrical conductivity—0 to 2 mmhos/cm
Reaction—pH 7.9 to 9.0

Marias Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (0.06 inch/hour)
Landform: Lake plains
Parent material: Glaciolacustrine deposits
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic, frigid Chromic Udic Haplusterts

Typical Pedon

Marias silty clay, 0 to 4 percent slopes, in an area of cropland; 1,300 feet south and 650 feet west of the northeast corner of sec. 10, T. 31 N., R. 14 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; strong fine granular structure; slightly hard, friable, very sticky and very plastic; common very fine roots; common very fine pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.

Bw—6 to 17 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; strong fine angular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; few very fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bss—17 to 30 inches; light brownish gray (10YR 6/2) silty clay, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky and very plastic; few very fine roots; few very fine pores; common slickensides intersecting at 20 to 30 degrees from horizontal; strongly effervescent; moderately alkaline; gradual smooth boundary.

By—30 to 60 inches; light brownish gray (10YR 6/2) silty clay, grayish brown (10YR 5/2) moist; weak coarse prismatic structure; very hard, firm, very sticky and very plastic; few very fine roots; few very fine pores; common fine threads of gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher
Depth to By horizon: 20 to 45 inches
Linear extensibility: .06 to .10 in the upper 30 inches of soil; cracks 1-1/2 inches or more wide to 20 inches

Ap horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, or 6 dry; 3, 4, or 5 moist
Chroma—1, 2, or 3
Clay content—40 to 60 percent
Electrical conductivity—0 to 4 mmhos/cm
Sodium adsorption ratio—1 to 4
Calcium carbonate equivalent—1 to 10 percent
Reaction—pH 7.4 to 8.4.

Bw horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Clay or silty clay
Clay content—35 to 60 percent clay
Electrical conductivity—0 to 4 mmhos/cm
Sodium adsorption ratio—1 to 4
Calcium carbonate equivalent—1 to 10 percent
Reaction—pH 7.9 to 8.4

Bss horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Clay or silty clay
Clay content—35 to 60 percent clay
Slickensides: Common or many
Electrical conductivity—0 to 4
Sodium adsorption ratio—1 to 4
Calcium carbonate equivalent—1 to 10 percent
Reaction—pH 7.9 to 9.0

By horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 3, 4, or 5 moist
Chroma—1, 2, or 3
Texture—Clay or silty clay
Clay content—35 to 60
Gypsum—1 to 6 percent
Electrical conductivity—2 to 4 mmhos/cm above a depth of 30 inches; 2 to 8 mmhos/cm below 30 inches

Sodium adsorption ratio—1 to 4 above 30 inches; 4 to 13 below 30 inches
Calcium carbonate equivalent—2 to 10 percent
Reaction—pH 7.9 to 9.0

74B—Marias silty clay, 0 to 4 percent slopes

Setting

Landform: Lake plains
Slope: 0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Marias and similar soils: 85 percent

Minor Components

Dimmick and similar soils: 0 to 2 percent
Marvan and similar soils: 0 to 3 percent
Kobase and similar soils: 0 to 2 percent
Scobey and similar soils: 0 to 8 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 8.5 inches

Marmarth Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains
Parent material: Semiconsolidated sedimentary beds
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Marmarth loam, 0 to 4 percent slopes, in an area of cropland; 2,400 feet north and 900 feet east of the southwest corner of sec. 25, T. 36 N., R. 9 E.

Ap—0 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure parting to weak very fine granular; soft, very friable, sticky and plastic; common very fine roots; mildly alkaline; abrupt smooth boundary.
Bt—6 to 13 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; common very fine roots; few very fine pores; few faint clay films on faces of peds; mildly alkaline; clear wavy boundary.
Bk—13 to 30 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; few very fine pores; common fine soft masses of lime; slightly effervescent; moderately alkaline; gradual wavy boundary.
Cr—30 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated sedimentary beds, olive brown (2.5Y 4/4) moist; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches
Depth to Cr horizon: 20 to 40 inches
Depth to the Bk horizon: 11 to 27 inches

A horizon
Value—3, 4, or 5 moist
Chroma—2 or 3
Clay content—20 to 27 percent
Reaction—pH 6.1 to 7.3

Bt horizon
Hue—10YR or 2.5Y
Value—3, 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam, clay loam, or sandy clay loam
Clay content—18 to 35 percent
Reaction—pH 6.1 to 7.8

Bk horizon
Hue—2.5Y or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam, fine sandy loam, or clay loam
Clay content—15 to 30 percent
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.4 to 8.4

Cr horizon
Material: Semiconsolidated sandstone or stratified semiconsolidated sandstone and siltstone

92B—Marmarth loam, 0 to 4 percent slopes

Setting

Landform: Sedimentary plains
Slope: 0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Marmarth and similar soils: 85 percent

Minor Components

Cabbart and similar soils: 0 to 2 percent
Delpoint, calcareous soils: 0 to 3 percent
Delpoint and similar soils: 0 to 7 percent
Soils that have slopes more than 4 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 5.0 inches

Marvan Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (0.06 inch/hour)
Landform: Alluvial fans and lake plains
Parent material: Alluvium and glaciolacustrine deposits
Slope range: 0 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic, frigid Sodic Haplusterts

Typical Pedon

Marvan clay, 0 to 2 percent slopes, in an area of rangeland; 1,850 feet south and 2,700 feet west of the northeast corner of sec. 3, T. 37 N., R. 12 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak fine angular blocky structure parting to moderate very fine granular; very hard, very firm, very sticky and very plastic; many fine and medium roots; many fine and medium pores; mildly alkaline; clear smooth boundary.
Bw—4 to 13 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; many fine and medium roots; many very fine and fine pores; slightly effervescent; mildly alkaline; clear wavy boundary.
Bssy—13 to 32 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium subangular blocky structure; extremely hard, extremely firm, very sticky and very plastic; common medium and coarse roots; common very fine and fine pores; few slickensides intersecting at 40 degrees from horizontal; few fine masses of gypsum; strongly effervescent; moderately alkaline; clear wavy boundary.
Bnssyz—32 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium subangular blocky structure; extremely hard, extremely firm, very sticky and very plastic; few very fine pores; few slickensides intersecting at 40 degrees from horizontal; common fine masses of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher
Depth to Bssy horizon: 10 to 24 inches
Soil phases: Saline

A horizon
Hue—2.5Y or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Clay content—40 to 60 percent

Electrical conductivity—0 to 8 mmhos/cm; saline phase is 2 to 8 mmhos/cm
Sodium adsorption ratio—0 to 4
Calcium carbonate equivalent—1 to 5 percent
Reaction—pH 7.4 to 9.0

Bw horizon
Hue—2.5Y or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay or silty clay
Clay content—45 to 60 percent
Electrical conductivity—2 to 8 mmhos/cm
Sodium adsorption ratio—4 to 13; saline phase is 4 to 8 (where the SAR is below 8 the sodium plus magnesium is greater than calcium plus exchange acidity)
Calcium carbonate equivalent—1 to 10 percent
Reaction—pH 7.9 to 9.0

Bssy horizon
Hue—2.5Y or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay or silty clay
Clay content—45 to 60 percent
Gypsum—1 to 5 percent
Electrical conductivity—4 to 16 mmhos/cm; ECs are less then 8 above a depth of 35 inches
Sodium adsorption ratio—13 to 38
Calcium carbonate equivalent—1 to 10 percent
Reaction—pH 7.9 to 9.0

Bnssyz horizon
Hue—2.5 or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay or silty clay that includes thin layers of silty clay loam and silt loam material
Clay content—45 to 60 percent
Gypsum—1 to 5 percent
Electrical conductivity—8 to 16 mmhos/cm
Sodium adsorption ratio—13 to 38
Calcium carbonate equivalent—1 to 10 percent
Reaction—pH 7.9 to 9.0

30A—Marvan clay, 0 to 2 percent slopes

Setting

Landform: Lake plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Marvan and similar soils: 85 percent

Minor Components

McKenzie and similar soils: 0 to 1 percent
Marvan, saline soils: 0 to 7 percent
Kobase and similar soils: 0 to 7 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: About 6.8 inches

30C—Marvan clay, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Marvan and similar soils: 85 percent

Minor Components

Marvan, saline soils: 0 to 5 percent
Kobase and similar soils: 0 to 5 percent
Soils that have slopes less than 2 percent: 0 to 4 percent
Soils that have slopes more than 8 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: About 6.8 inches

309A—Marvan complex, 0 to 2 percent slopes

Setting

Landform: Marvan, saline—Lake plains; Marvan—Lake plains
Slope: Marvan, saline—0 to 2 percent; Marvan—0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Marvan, saline and similar soils: 55 percent
Marvan and similar soils: 30 percent

Minor Components

Nishon and similar soils: 0 to 2 percent
Nobe and similar soils: 0 to 6 percent
Benz and similar soils: 0 to 5 percent
Soils that have slopes more than 2 percent: 0 to 2 percent

Major Component Description

Marvan, saline

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.3 inches

Marvan

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 6.8 inches

304A—Marvan-Nobe clays, 0 to 2 percent slopes

Setting

Landform: Marvan—lake plains; Nobe—lake plains
Position on landform: Marvan—microlows; Nobe—microhighs
Slope: Marvan—0 to 2 percent; Nobe—0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Marvan and similar soils: 55 percent
Nobe and similar soils: 30 percent

Minor Components

Somewhat poorly drained soils: 0 to 2 percent
Benz and similar soils: 0 to 10 percent
Soils that have slopes more than 2 percent: 0 to 3 percent

Major Component Description

Marvan

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.3 inches

Nobe

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 4.2 inches

McKenzie Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Poorly drained
Permeability: Very slow (0.06 inch/hour)

Landform: Closed depressions
Parent material: Alluvium
Slope range: 0 to 1 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic, frigid Chromic Endoaquerts

Typical Pedon

McKenzie clay, 0 to 1 percent slopes, in an area of rangeland; 1,000 feet north and 2,600 feet west of the southeast corner of sec. 10, T. 35 N., R. 12 E.

A—0 to 5 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; few fine faint olive yellow (2.5Y 6/6) mottles; weak coarse subangular blocky structure parting to weak fine granular structure; extremely hard, very firm, very sticky and very plastic; few very fine roots; common very fine pores; strongly effervescent; strongly alkaline; clear smooth boundary.

Byz—5 to 20 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; few faint olive yellow (2.5Y 6/6) mottles; moderate very coarse subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine roots; common very fine pores; few fine seams of gypsum and other salts; strongly effervescent; strongly alkaline; gradual wavy boundary.

Cyz—20 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; few faint olive yellow (2.5Y 6/6) mottles; massive; extremely hard, very firm, very sticky and very plastic; few very fine roots; few very fine pores; common fine seams of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to water table: +.5 to 1 foot
Taxonomic note: This soil is a taxadjunct to the McKenzie series and classifies as fine, montmorillonitic (calcareous), frigid Vertic Epiaquepts. It does not have the required slickensides, cracks, or water table characteristics of Chromic Endoaquerts.

A horizon
Hue—5Y, 2.5Y, or 10YR
Value—4 or 5 moist; 4, 5, or 6 dry
Chroma—1 or 2
Clay content—40 to 60 percent
Electrical conductivity—8 to 16 mmhos/cm
Reaction—pH 8.5 to 9.0

Byz horizon
Hue—2.5Y or 5Y
Value—4 or 5 moist; 5 or 6 dry
Chroma—1 or 2
Texture—Clay or silty clay
Clay content—40 to 60 percent
Electrical conductivity—8 to 16 mmhos/cm
Reaction—8.5 to 9.0

Cyz horizon
Hue—2.5Y or 5Y
Value—4, 5, or 6 moist; 5, 6, or 7 dry
Chroma—1, 2, or 3
Clay content—40 to 60 percent
Electrical conductivity—8 to 16 mmhos/cm
Reaction—pH 8.5 to 9.0.

13A—McKenzie clay, 0 to 1 percent slopes

Setting

Landform: Closed depressions
Slope: 0 to 1 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

McKenzie and similar soils: 85 percent

Minor Components

Dimmick and similar soils: 0 to 10 percent
Wheatbelt and similar soils: 0 to 2 percent
Soils that are loamy throughout: 0 to 1 percent
Marvan, saline soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Ponding: Long
Salt affected: Saline within 30 inches
Available water capacity: About 4.5 inches

M-W—Miscellaneous Water

Composition

Major Components

Miscellaneous water: 100 percent

Major Component Description

Definition: Areas of sewage lagoons, industrial waste pits, and fish hatcheries, etc.

Neldore Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Hills
Parent material: Semiconsolidated shale
Slope range: 2 to 70 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents

Typical Pedon

Neldore clay, in an area of Bascovy-Neldore clays, 2 to 15 percent slopes, in rangeland; 1,800 feet south and 1,600 feet west of the northeast corner of sec. 7, T. 30 N., R. 10 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong very fine granular structure; hard, very firm, very sticky and very plastic; many very fine and few fine roots; neutral; clear smooth boundary.

C1—3 to 10 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; many very fine roots; common very fine pores; mildly alkaline; gradual smooth boundary.

C2—10 to 16 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine pores; 25 percent soft thin shale chips; mildly alkaline; gradual smooth boundary.

Cr—16 to 60 inches; gray (N 6/0) semiconsolidated shale, very dark grayish brown (2.5Y 3/2) moist; few fine masses of gypsum between the shale plates; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or above
Depth to shale: 10 to 20 inches

A horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, or 6 dry; 3, 4, or 5 moist
Chroma—1 or 2
Texture—Clay or silty clay
Clay content—40 to 50 percent
Content of rock fragments—0 to 10 percent—0 to 5 percent stones and cobbles, 0 to 5 percent pebbles. In some pedons the stones, cobbles, and pebbles are from a thin glacial mantle that has been eroded away.
Reaction—pH 5.6 to 7.8

C1 horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—1 or 2; 4 or 6 for stains of shale
Texture—Clay or silty clay
Clay content—40 to 60 percent
Content of rock fragments—5 to 35 percent—5 to 25 percent soft shale fragments, 0 to 10 percent hard shale fragments
Electrical conductivity—0 to 4 mmhos/cm
Reaction—pH 5.6 to 7.8

C2 horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—1 or 2
Texture—Clay or silty clay
Clay content—40 to 60 percent
Electrical conductivity—0 to 4 mmhos/cm
Content of rock fragments—65 to 90 percent shale fragments—65 to 75 percent soft shale fragments, 0 to 15 percent hard shale fragments
Reaction—pH 5.6 to 7.8
Other features—Gypsum crystals are few to common at the shale contact and in the lower 1- to 2-inches of the C2 horizon

Cr horizon
Other features—The shale fragments are extremely hard or very hard when dry and extremely firm or very firm when moist
Reaction—pH 5.1 to 7.3

971F—Neldore-Bascovy silty clays, 25 to 60 percent slopes

Setting

Landform: Neldore—hills; Bascovy—hills
Position on landform: Neldore—shoulders; Bascovy—back slopes
Slope: Neldore—25 to 60 percent; Bascovy—25 to 60 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Neldore and similar soils: 45 percent
Bascovy and similar soils: 40 percent

Minor Components

Marvan and similar soils: 0 to 5 percent
Harlake and similar soils: 0 to 1 percent
Yawdim and similar soils: 0 to 4 percent
Areas of badland: 0 to 4 percent
Areas of rock outcrop: 0 to 1 percent

Major Component Description

Neldore

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 2.3 inches

Bascovy

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 4.0 inches

974F—Neldore-Hillon complex, 25 to 70 percent slopes

Setting

Landform: Neldore—hills; Hillon—hills
Position on landform: Neldore—back slopes; Hillon—shoulders
Slope: Neldore—25 to 70 percent; Hillon—25 to 70 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Neldore and similar soils: 45 percent
Hillon and similar soils: 40 percent

Minor Components

Havre, occasionally flooded: 0 to 1 percent
Blacksheep and similar soils: 0 to 3 percent
Bascovy and similar soils: 0 to 7 percent
Areas of badland: 0 to 3 percent
Areas of rock outcrop: 0 to 1 percent

Major Component Description

Neldore

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 2.3 inches

Hillon

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.9 inches

Nesda Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate in the upper 0 to 14 inches (0.6 to 2.0 inches/hour); rapid below this depth (6.0 to 20.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 100 days

Taxonomic Class: Sandy-skeletal, mixed Fluventic Haploborolls

Typical Pedon

Nesda very gravelly sandy loam, in an area of Nesda complex, 0 to 2 percent slopes, in woodland; 700 feet north and 2,300 feet west of the southeast corner of sec. 28, T. 29 N., R. 16 E.

A1—0 to 6 inches; dark grayish brown (2.5Y 4/2) very gravelly sandy loam, very dark grayish brown (2.5Y 3/2) moist; strong very fine granular structure; loose, nonsticky and nonplastic; few medium and many fine and very fine roots; few very fine pores; 40 percent pebbles, 10 percent cobbles; neutral; clear smooth boundary.

A2—6 to 13 inches; dark grayish brown (2.5Y 4/2) extremely gravelly sandy loam, very dark grayish brown (2.5Y 3/2) moist; single grain; loose, nonsticky and nonplastic; few medium and many fine and very fine roots; 60 percent pebbles, 5 percent cobbles; neutral; clear wavy boundary.

2C—13 to 60 inches; grayish brown (2.5Y 5/2) extremely gravelly sand, dark grayish brown (2.5Y 4/2) moist; masssive; loose, nonsticky and nonplastic; few fine and many very fine roots; 55 percent pebbles, 10 percent cobbles, 5 percent stones; mildly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 12 and 35 inches
Mollic epipedon thickness: 10 to 16 inches
Depth to 2C horizon: 10 to 20 inches
Soil phases: Occasionally flooded

A1 and A2 horizons
Hue—10YR, 2.5Y, or 5Y
Value—3, 4, or 5 dry; 2 or 3 moist
Chroma—1, 2, or 3
Texture—Loam or sandy loam
Clay content—10 to 20 percent
Content of rock fragments—15 to 60 percent—0 to 15 percent stones and cobbles, 15 to 45 percent pebbles
Calcium carbonate equivalent—0 to 5 percent
Reaction—pH 6.6 to 7.8

2C horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, 6, or 7 dry; 3, 4, or 5 moist
Chroma—1, 2, 3, or 4
Texture—Sand or loamy sand
Clay content—0 to 10 percent
Content of rock fragments—35 to 80 percent—0 to 15 percent stones and cobbles, 35 to 65 percent pebbles
Calcium carbonate equivalent—0 to 5 percent
Reaction—pH 7.4 to 8.4

832A—Nesda complex, 0 to 2 percent slopes

Setting

Landform: Nesda—flood plains; Nesda—flood plains
Slope: Nesda—0 to 2 percent; Nesda—0 to 2 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Nesda and similar soils: 45 percent
Nesda and similar soils: 40 percent

Minor Components

Eagleton and similar soils: 0 to 2 percent
Nesda, frequently flooded: 0 to 3 percent
Enbar and similar soils: 0 to 3 percent
Straw and similar soils: 0 to 7 percent

Major Component Description

Nesda

Surface layer texture: Very gravelly sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Occasional
Available water capacity: About 2.9 inches

Nesda

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Rare
Available water capacity: About 3.5 inches

Nishon Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Poorly drained
Permeability: Very slow (0.06 inch/hour)
Landform: Closed depressions
Parent material: Alluvium
Slope range: 0 to 1 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic, frigid Typic Albaqualfs

Typical Pedon

Nishon clay loam, 0 to 1 percent slopes, in an area of cropland; 300 feet south and 300 feet east of the northwest corner of sec. 6, T. 34 N., R. 12 E.

Ap—0 to 6 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; few fine prominent dark yellowish brown (10YR 4/4) redox concentrations; strong medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; slightly acid; abrupt wavy boundary.

Btg—6 to 24 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; few medium distinct dark yellowish brown (10YR 4/4) redox concentrations; moderate medium angular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine pores; common distinct clay films on faces of peds and lining pores; mildly alkaline; clear wavy boundary.

Bkg1—24 to 39 inches; light gray (5Y 6/1) clay loam, dark gray (5Y 4/1) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine pores; common fine, medium and coarse soft masses and threads of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkg2—39 to 50 inches; light gray (5Y 6/1) clay loam, dark gray (5Y 4/1) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; many very fine pores; common fine, medium and coarse soft masses and threads of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bkg3—50 to 60 inches; light gray (5Y 6/1) clay, dark gray (5Y 4/1) moist; weak coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Depth to water table: 1 to 3 feet
Depth to the Bk horizon: 16 to 34 inches

Ap horizon
Hue—2.5Y or 10YR
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—1 or 2
Redox concentrations—Few to common (10YR 5/3, 4/3, or 4/4)
Clay content—27 to 35 percent
Reaction—pH 6.1 to 8.4

Btg horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, or 6 dry; 3 or 4 moist
Chroma—0, 1, or 2
Redox concentrations—Few to common (10YR 5/3, 4/3, 4/4 or 2.5Y 5/2, 5/3)
Texture—Clay or silty clay
Clay content—40 to 60 percent
Reaction—pH 6.6 to 9.0

Bkg horizon
Hue—2.5Y or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Texture—Clay loam, clay, or silty clay
Clay content—35 to 55 percent
Calcium carbonate equivalent—1 to 15 percent
Gypsum—1 to 3 percent
Reaction—pH 7.4 to 9.0

28A—Nishon clay loam, 0 to 1 percent slopes

Setting

Landform: Closed depressions
Slope: 0 to 1 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Nishon and similar soils: 85 percent

Minor Components

Dimmick and similar soils: 0 to 10 percent
McKenzie and similar soils: 0 to 3 percent
Phillips and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Ponding: Long
Available water capacity: About 9.3 inches

Nobe Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (0.06 inch/hour)
Landform: Flood plains and lake plains
Parent material: Alluvium and glaciolacustrine deposits
Slope range: 0 to 2 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Oxyaquic Ustorthents

Typical Pedon

Nobe clay, in an area of Bullhook-Nobe complex, 0 to 2 percent slopes, in rangeland; 100 feet north and 50 feet west of the southeast corner of sec. 7, T. 30 N., R. 14 E.

E—0 to 1 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate very coarse platy structure parting to weak coarse subangular blocky; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine pores; strongly alkaline; abrupt smooth boundary.

Bt—1 to 4 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine columnar structure parting to strong medium subangular blocky; hard, firm, very sticky and very plastic; many very fine roots; common very fine pores; common faint clay films on faces of peds; strongly alkaline; abrupt wavy boundary.

Byz1—4 to 17 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; few very fine pores; common medium masses of gypsum and other salts; strongly effervescent; moderately alkaline; gradual wavy boundary.

Byz2—17 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular structure; very hard, firm, sticky and very plastic; few very fine roots; common fine masses of gypsum and other salts; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 to 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F
Depth to saturated zone: 24 to 60 inches for 1 to 4 months in the spring

E horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 3, 4, or 5 moist
Chroma—2 or 3
Clay content—40 to 60 percent
Electrical conductivity—4 to 8 mmhos/cm
Sodium adsorption ratio—0 to 13
Calcium carbonate equivalent—1 to 5 percent
Reaction—pH 6.6 to 8.4

Bt horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Texture—Clay, silty clay, or silty clay loam
Clay content—40 to 50 percent
Electrical conductivity—4 to 8 mmhos/cm
Sodium adsorption ratio—0 to 30
Calcium carbonate equivalent—1 to 5 percent
Reaction—pH 6.6 to 8.4

Byz1 horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Texture—Clay, silty clay, or silty clay loam
Clay content—35 to 60 percent
Electrical conductivity—16 to 30 mmhos/cm
Gypsum—1 to 6 percent
Sodium adsorption ratio—13 to 40 percent

Calcium carbonate equivalent—1 to 5 percent
Reaction—pH 7.9 to 10.0

Byz2 horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Texture—Clay, silty clay, or silty clay loam that is stratified with loam, clay loam, and silt loam
Clay content—35 to 60 percent
Electrical conductivity—16 to 30 mmhos/cm
Gypsum—1 to 6
Sodium adsorption ratio—15 to 70
Calcium carbonate equivalent—1 to 5 percent
Reaction—pH 7.9 to 10.0

Obrien Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Hills
Parent material: Glacial till
Slope range: 15 to 60 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed Pachic Haploborolls

Typical Pedon

Obrien clay loam, in an area of Zahill-Obrien clay loams, 15 to 60 percent slopes, in rangeland; 550 feet north and 2,250 feet west of the southeast corner of sec. 7, T. 30 N., R. 17 E.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, firm, sticky and plastic; many very fine roots; many very fine pores; neutral; clear smooth boundary.
A2—5 to 21 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many very fine roots; many very fine pores; neutral; clear wavy boundary.
Bk1—21 to 37 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many very fine roots; common very fine pores; common fine soft masses and threads of lime; strongly effervescent; moderately alkaline; clear smooth boundary.
Bk2—37 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; common very fine pores; many fine soft masses and threads of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 46 degrees F
Moisture control section: Between 4 and 12 inches
Mollic epipedon thickness: 16 to 33 inches
Depth to Bk horizon: 16 to 33 inches

A1 horizon
Hue—10YR or 2.5Y
Value—3 or 4 dry; 2 or 3 moist
Clay content—27 to 35 percent
Reaction—pH 6.6 to 7.3

A2 horizon
Hue—10YR or 2.5Y
Value—3 or 4 dry; 2 or 3 moist
Clay content—27 to 35 percent
Reaction—pH 6.6 to 7.3

Bk1 horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay loam or loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—less than 4 mmhos/cm
Reaction—pH 7.9 to 8.4

Bk2 horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay loam or loam
Clay content—18 to 35 percent
Bulk density—1.55 to 1.75
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—less than 4 mmhos/cm
Reaction—pH 7.9 to 9.0

Perma Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Moderate in the upper 0 to 30 inches

(0.6 to 2.0 inches/hour); moderately rapid below this depth (2.0 to 6.0 inches/hour)
Landform: Mountains
Parent material: Colluvium
Slope range: 25 to 70 percent
Annual precipitation: 15 to 22 inches
Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 100 days

Taxonomic Class: Loamy-skeletal, mixed Typic Haploborolls

Typical Pedon

Perma cobbly loam, in an area of Perma-Whitlash complex, 25 to 70 percent slopes, in an area of rangeland; 300 feet north and 1,000 feet west of the southeast corner of sec. 17, T. 28 N., R. 16 E.

A—0 to 10 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; common very fine pores; 15 percent pebbles, 15 percent cobbles; neutral; clear smooth boundary.

Bw1—10 to 20 inches; grayish brown (10YR 5/2) very cobbly loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; common very fine pores; 15 percent pebbles, 25 percent cobbles; neutral; gradual wavy boundary.

Bw2—20 to 30 inches; grayish brown (10YR 5/2) very cobbly loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; common very fine pores; 25 percent pebbles, 25 percent cobbles; neutral; clear wavy boundary.

BC—30 to 60 inches; pale brown (10YR 6/3) extremely cobbly sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and nonplastic; few very fine roots; 25 percent pebbles, 25 percent cobbles, 15 percent stones; neutral.

Range in Characteristics

Mollic epipedon thickness: 10 to 15 inches

A horizon
Value—4 or 5 dry; 2 or 3 moist
Chroma—2 or 3
Clay content—7 to 20 percent
Content of rock fragments—15 to 35 percent—0 to 15 percent cobbles, stones, and boulders; 15 to 20 percent pebbles
Reaction—pH 6.6 to 7.3

Bw horizon
Hue—10YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Loam or sandy loam
Clay content—7 to 20 percent
Content of rock fragments—35 to 85 percent—0 to 50 percent cobbles and stones, 25 to 65 percent pebbles
Reaction—pH 6.6 to 7.8

C horizon
Hue—10YR or 7.5YR
Value—6 or 7 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Loam, loamy sand, or sandy loam
Clay content—0 to 15 percent
Content of rock fragments—60 to 85 percent—10 to 50 percent cobbles and stones, 50 to 65 percent pebbles
Reaction—pH 6.6 to 7.8

883F—Perma-Whitlash complex, 25 to 70 percent slopes

Setting

Landform: Perma—mountains; Whitlash—mountains
Position on landform: Perma—back slopes; Whitlash—shoulders
Slope: Perma—25 to 70 percent; Whitlash—25 to 70 percent
Mean annual precipitation: 15 to 22 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Perma and similar soils: 50 percent
Whitlash and similar soils: 35 percent

Minor Components

Perma very cobbly loam: 0 to 6 percent
Perma gravelly loam: 0 to 2 percent
Hedoes and similar soils: 0 to 3 percent
Soils with ponderosa pine: 0 to 1 percent
Areas of rubble land: 0 to 2 percent
Areas of rock outcrop: 0 to 1 percent

Major Component Description

Perma

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 4.1 inches

Whitlash

Surface layer texture: Cobbly sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 1.4 inches

896F—Perma-Whitlash, cool-Rock outcrop complex, 25 to 70 percent slopes

Setting

Landform: Perma—mountains; Whitlash—mountains; Rock outcrop—mountains
Position on landform: Perma—back slopes; Whitlash—shoulders; Rock outcrop—shoulders
Slope: Perma—25 to 70 percent; Whitlash—25 to 70 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Perma and similar soils: 35 percent
Whitlash and similar soils: 30 percent
Rock outcrop: 20 percent

Minor Components

Hedoes and similar soils: 0 to 3 percent
Belain and similar soils: 0 to 4 percent
Soils that have slopes less than 25 percent: 0 to 5 percent
Areas of rubble land: 0 to 3 percent

Major Component Description

Perma

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 4.1 inches

Whitlash

Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Forest land
Flooding: None
Available water capacity: About 1.7 inches

Rock outcrop

Definition: Exposures of igneous and metamorphic bedrock
Flooding: None

Phillips Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Glacial till
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic Typic Eutroboralfs

Typical Pedon

Phillips loam, in an area of Phillips-Elloam complex, 0 to 4 percent slopes, in rangeland; 300 feet north and 100 feet west of the southeast corner of sec. 16, T. 36 N., R. 10 E.

A—0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, sticky and plastic; many very fine roots; many very fine pores; neutral; clear smooth boundary.

E—4 to 10 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium and coarse platy structure parting to weak medium subangular; hard, friable, sticky and plastic; many very fine roots; common very fine pores; neutral; abrupt smooth boundary.

Bt—10 to 20 inches; brown (10YR 5/3) clay, dark grayish brown (10YR 4/2) moist; moderate medium and coarse prismatic structure parting to strong fine subangular blocky; very hard, very firm, very sticky and very plastic; common distinct clay films on faces of peds; many very fine roots; common very fine pores; neutral; clear wavy boundary.

Bk1—20 to 30 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak medium and coarse subangular blocky structure; very hard, very firm, very sticky and plastic; few very fine roots; common very fine pores; common fine and medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—30 to 40 inches; light brownish gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; weak medium and coarse subangular blocky structure; very hard, firm, very sticky and plastic; few very fine roots; few very fine pores; many large soft masses of lime; violently effervescent; strongly alkaline; gradual wavy boundary.

By—40 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; common very fine pores; few fine masses of gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

Moisture control section: 35 to 45 percent
Depth to the Bk horizon: 12 to 20 inches
Depth to the By horizon: 30 to 40 inches

A horizon
Hue—10YR or 2.5Y
Value—5 dry; 3 or 4 moist
Chroma—2 or 3
Clay content—15 to 27 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Reaction—pH 6.1 to 7.3

E horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Loam or sandy loam
Clay content—15 to 27 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Reaction—pH 6.1 to 7.3
Other features—Some pedons have an E/B horizon

Bt horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Clay loam or clay
Clay content—35 to 45 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Electrical conductivity—0 to 2 mmhos/cm
Reaction—pH 6.6 to 8.4

Bk1 and Bk2 horizons
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—25 to 40 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Electrical conductivity—2 to 4 mmhos/cm
Calcium carbonate equivalent—5 to 15 percent
Sodium adsorption ratio—0 to 13
Reaction—pH 7.4 to 9.0

By horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—20 to 35 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Electrical conductivity—4 to 8 mmhos/cm
Gypsum—1 to 3 percent
Sodium adsorption ratio—0 to 13
Bulk density—More than 1.6g/cc
Reaction—pH 7.4 to 9.0

33A—Phillips loam, 0 to 2 percent slopes

Setting

Landform: Till plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Phillips and similar soils: 85 percent

Minor Components

Nishon and similar soils: 0 to 2 percent
Thoeny and similar soils: 0 to 3 percent
Scobey and similar soils: 0 to 8 percent
Hillon and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

331B—Phillips-Elloam complex, 0 to 4 percent slopes

Setting

Landform: Phillips—till plains; Elloam—till plains
Position on landform: Phillips—microhighs; Elloam—microlows
Slope: Phillips—0 to 4 percent; Elloam—0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Phillips and similar soils: 60 percent
Elloam and similar soils: 25 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Scobey and similar soils: 0 to 6 percent
Hillon and similar soils: 0 to 3 percent
Absher and similar soils: 0 to 1 percent
Soils that have slopes more than 4 percent: 0 to 4 percent

Major Component Description

Phillips

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

Elloam

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.5 inches

334B—Phillips-Kevin complex, 0 to 4 percent slopes

Setting

Landform: Phillips—till plains; Kevin—till plains
Position on landform: Phillips—foot slopes; Kevin—back slopes
Slope: Phillips—0 to 2 percent; Kevin—2 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Phillips and similar soils: 55 percent
Kevin and similar soils: 30 percent

Minor Components

Nishon and similar soils: 0 to 2 percent
Scobey and similar soils: 0 to 9 percent
Hillon and similar soils: 0 to 2 percent
Elloam and similar soils: 0 to 1 percent
Soils that have slopes more than 4 percent: 0 to 1 percent

Major Component Description

Phillips

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

400F—Rubble land-Rock outcrop complex

Setting

Landform: Rubble land—mountains; Rock outcrop—mountains
Position on landform: Rubble land—back slopes and foot slopes; Rock outcrop—shoulders and summits
Mean annual precipitation: 15 to 22 inches
Frost-free period: 50 to 100 days

Composition

Major Components

Rubble land: 45 percent
Rock outcrop: 40 percent

Minor Components

Areas supporting trees: 0 to 15 percent

Major Component Description

Rubble land

Definition: Areas with more than 90 percent of the surface covered by stones and boulders, supporting little or no vegetation
Dominant parent material: Material weathered from igneous rocks
Flooding: None

Rock outcrop

Definition: Exposures of bare bedrock
Dominant parent material: Material weathered from igneous rocks
Flooding: None

Scobey Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Glacial till
Slope range: 0 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Scobey clay loam, in an area of Scobey-Kevin clay loams, 0 to 4 percent slopes, in ˇcropland; 2,400 feet north and 2,500 feet east of the southwest corner of sec. 7, T. 35 N., R. 8 E.

Ap—0 to 6 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate fine and very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and few fine roots; many very fine pores; mildly alkaline; clear smooth boundary.

Bt—6 to 14 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; strong medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine pores; many faint clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bk1—14 to 21 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; common very fine roots; few very fine pores; common medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—21 to 42 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; few very fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bky—42 to 60 inches; grayish brown (2.5Y 5/3) clay loam, dark grayish brown (2.5Y 4/3) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; few very fine soft masses of lime; common fine masses of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches
Depth to the Bk horizon: 10 to 16 inches
Depth to the Bky horizon: 30 to 60 inches

Ap horizon
Hue—10YR or 2.5Y
Chroma—2 or 3
Clay content—27 to 35 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles and stones, trace to 10 percent pebbles
Reaction—pH 6.1 to 7.8

Bt horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Clay loam or clay
Clay content—35 to 45 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, trace to 10 percent pebbles
Reaction—pH 6.6 to 8.4

Bk1 and Bk2 horizons
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Clay content—30 to 40 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, trace to 10 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.4 to 8.4
Other features—Some pedons have a Btk horizon

Bky horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Clay content—30 to 40 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, trace to 10 percent pebbles
Calcium carbonate equivalent—5 to 12 percent
Sodium adsorption ratio—1 to 8
Gypsum—1 to 6 percent
Reaction—pH 7.4 to 9.0
Other features—Some pedons have a By or C horizon below a depth of 40 inches

564B—Scobey-Hillon clay loams, 0 to 4 percent slopes

Setting

Landform: Scobey—till plains; Hillon—till plains
Position on landform: Scobey—foot slopes; Hillon—back slopes
Slope: Scobey—0 to 4 percent; Hillon—0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Scobey and similar soils: 45 percent
Hillon and similar soils: 40 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Marias and similar soils: 0 to 7 percent
Soils that are not deep-plowed: 0 to 2 percent
Soils that have slopes more than 4 percent: 0 to 5 percent

Major Component Description

Scobey

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.9 inches

Hillon

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.9 inches

561B—Scobey-Kevin clay loams, 0 to 4 percent slopes

Setting

Landform: Scobey—till plains; Kevin—till plains
Position on landform: Scobey—foot slopes; Kevin—back slopes
Slope: Scobey—0 to 4 percent; Kevin—0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Scobey and similar soils: 55 percent
Kevin and similar soils: 30 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Hillon and similar soils: 0 to 6 percent
Phillips and similar soils: 0 to 3 percent
Kevin, calcareous soils: 0 to 4 percent
Soils that have slopes more than 4 percent: 0 to 1 percent

Major Component Description

Scobey

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.9 inches

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

561C—Scobey-Kevin clay loams, 4 to 8 percent slopes

Setting

Landform: Scobey—till plains; Kevin—till plains
Position on landform: Scobey—foot slopes; Kevin—back slopes
Slope: Scobey—4 to 8 percent; Kevin—4 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Scobey and similar soils: 50 percent
Kevin and similar soils: 35 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Hillon and similar soils: 0 to 9 percent
Marias and similar soils: 0 to 1 percent
Soils that have slopes more than 8 percent: 0 to 3 percent
Soils that have slopes less than 4 percent: 0 to 1 percent

Major Component Description

Scobey

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.9 inches

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

Straw Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 70 to 100 days

Taxonomic Class: Fine-loamy, mixed Cumulic Haploborolls

Typical Pedon

Straw loam, in an area of Enbar-Straw-Eagleton loams, 0 to 2 percent slopes, in cropland; 800 feet south and 1,400 feet east of the northwest corner of sec. 12, T. 31 N., R. 16 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine pores; mildly alkaline; abrupt smooth boundary.

A2—7 to 13 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine pores; mildly alkaline; gradual wavy boundary.

A3—13 to 25 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium granular structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1—25 to 41 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

2C2—41 to 60 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; massive; loose, nonsticky and nonplastic; few very fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches
Mollic epipedon thickness: 16 to 40 inches

A horizon
Hue—10YR or 2.5Y
Value—3 or 4 dry; 2 or 3 moist
Chroma—2 or 3
Clay content—20 to 27 percent
Content of rock fragments—0 to 10 percent pebbles
Calcium carbonate equivalent—0 to 5 percent
Reaction—pH 6.6 to 8.4

C1 horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 3, 4, or 5 moist
Chroma—2, 3, or 4
Texture—Loam, silt loam, silty clay loam, or clay loam
Clay content—20 to 27 percent with less than 15 to 35 percent fine and coarser sand
Content of rock fragments—0 to 10 percent pebbles
Calcium carbonate equivalent—0 to 5 percent
Reaction—pH 6.6 to 8.4

2C horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Clay content—22 to 35 percent
Content of rock fragments—0 to 10 percent pebbles
Calcium carbonate equivalent—2 to 12 percent
Reaction—pH 7.4 to 8.4

831A—Straw-Korchea loams, 0 to 2 percent slopes

Setting

Landform: Straw—flood plains; Korchea—flood plains
Slope: Straw—0 to 2 percent; Korchea—0 to 2 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Straw and similar soils: 45 percent
Korchea and similar soils: 40 percent

Minor Components

Eagleton and similar soils: 0 to 2 percent
Korchea sandy loam: 0 to 3 percent
Nesda and similar soils: 0 to 5 percent
Havre and similar soils: 0 to 5 percent

Major Component Description

Straw

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: About 10.7 inches

Korchea

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: About 10.1 inches

Tally Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Till plains or hills
Parent material: Alluvium or eolian deposits
Slope range: 4 to 15 percent
Annual precipitation: 13 to 17 inches

Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Coarse-loamy, mixed Typic Haploborolls

Typical Pedon

Tally fine sandy loam, 4 to 15 percent slopes, in an area of cropland; 50 feet north and 1,300 feet east of the southwest corner of sec. 20, T. 30 N., R. 16 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common very fine pores; neutral; abrupt wavy boundary.

Bw1—8 to 13 inches; brown (7.5YR 5/2) fine sandy loam, dark brown (7.5YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine pores; neutral; gradual wavy boundary.

Bw2—13 to 31 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; few very fine pores; neutral; abrupt wavy boundary.

Bk1—31 to 44 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; loose, nonsticky and nonplastic; few fine threads of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—44 to 60 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; loose, nonsticky and nonplastic; common fine threads of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 8 and 24 inches
Mollic epipedon thickness: 7 to 16 inches
Depth to Bk horizon: 15 to 35 inches

Ap horizon
Hue—2.5Y, 10YR, or 7.5YR
Value—3, 4, or 5 dry; 2, 3, or 4 moist
Chroma—2 or 3
Clay content—10 to 20 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.1 to 7.8.

Bw1 horizon
Hue—7.5YR, 10YR, or 2.5Y
Value—4 or 5 dry; 2 or 3 moist
Chroma—2 or 3
Texture—Fine sandy loam or sandy loam
Clay content—5 to 18 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.6 to 8.4

Bw2 horizon
Hue—7.5YR, 10YR, or 2.5Y
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Fine sandy loam or sandy loam
Clay content—5 to 18 percent
Content of rock fragments—0 to 15 percent pebbles
Reaction—pH 6.6 to 8.4

Bk horizon
Hue—10YR, 2.5Y, or 7.5YR
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loamy fine sand, loamy sand, fine sand, fine sandy loam, or sandy loam
Clay content—5 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Content of rock fragments—0 to 15 percent pebbles above 40 inches, 0 to 25 percent below 40 inches
Reaction—pH 7.4 to 8.4

93D—Tally fine sandy loam, 4 to 15 percent slopes

Setting

Landform: Hills
Slope: 4 to 15 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Tally and similar soils: 85 percent

Minor Components

Farnuf and similar soils: 0 to 7 percent
Hedoes and similar soils: 0 to 5 percent

Soils that have slopes more than 15 percent: 0 to 2 percent
Soils that have slopes less than 4 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 7.9 inches

Telstad Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Glacial till
Slope range: 0 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Telstad loam, in an area of Telstad-Joplin loams, 0 to 4 percent slopes, in an area of cropland; 1,100 feet south and 1,400 feet east of the northwest corner of sec. 18, T. 30 N., R. 13 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; mildly alkaline; abrupt smooth boundary.

Bt—6 to 12 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak coarse and very coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; common faint clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bk1—12 to 30 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium and coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; few very fine pores; few fine soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—30 to 40 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; few very fine pores; few fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bky—40 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; few very fine pores; few fine soft masses of lime; few fine soft masses of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches
Depth to the Bk horizon: 10 to 20 inches

Ap horizon
Hue—10YR or 2.5Y
Chroma—2 or 3
Clay content—18 to 27 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Reaction—pH 6.6 to 7.8

Bt horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 3, 4, or 5 moist
Chroma—2 or 3
Texture—Loam or clay loam
Clay content—25 to 35 percent
Content of rock fragments—0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles
Reaction—pH 6.6 to 8.4

Bk1 horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Texture—Loam or clay loam
Clay content—20 to 32
Content of rock fragments—0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles
Electrical conductivity—2 to 4 mmhos/cm
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.9 to 8.4

Bk2 horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4

Texture—Loam or clay loam
Clay content—20 to 32 percent
Content of rock fragments—0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—2 to 4 mmhos/cm
Bulk density air dry: 1.7 or more
Reaction—pH 7.9 to 8.4

By horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—20 to 32 percent
Content of rock fragments—0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles
Calcium carbonate equivalent—3 to 12 percent
Electrical conductivity—2 to 4 mmhos/cm
Gypsum—0 to 3 percent
Bulk density—1.7 or more
Reaction—pH 7.9 to 9.0

501B—Telstad-Hillon loams, 0 to 4 percent slopes

Setting

Landform: Telstad—till plains; Hillon—till plains
Position on landform: Telstad—foot slopes; Hillon—back slopes
Slope: Telstad—0 to 4 percent; Hillon—0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Telstad and similar soils: 45 percent
Hillon and similar soils: 40 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Soils that are not deep-plowed: 0 to 2 percent
Hillon clay loam: 0 to 7 percent
Soils that have slopes more than 4 percent: 0 to 5 percent

Major Component Description

Telstad

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.9 inches

Hillon

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.0 inches

503B—Telstad-Joplin loams, 0 to 4 percent slopes

Setting

Landform: Telstad—till plains; Joplin—till plains (fig. 5)
Position on landform: Telstad—foot slopes; Joplin—back slopes
Slope: Telstad—0 to 4 percent; Joplin—0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Telstad and similar soils: 55 percent
Joplin and similar soils: 30 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Hillon and similar soils: 0 to 6 percent
Kremlin and similar soils: 0 to 4 percent
Scobey and similar soils: 0 to 1 percent
Joplin, calcareous soils: 0 to 1 percent
Soils that have slopes more than 4 percent: 0 to 2 percent

Major Component Description

Telstad

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.9 inches

Joplin

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.2 inches

503C—Telstad-Joplin loams, 4 to 8 percent slopes

Setting

Landform: Telstad—till plains; Joplin—till plains
Position on landform: Telstad—foot slopes; Joplin—back slopes
Slope: Telstad—4 to 8 percent; Joplin—4 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Telstad and similar soils: 50 percent
Joplin and similar soils: 35 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Hillon and similar soils: 0 to 6 percent
Joplin, calcareous soils: 0 to 2 percent
Scobey clay loam: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 2 percent
Soils that have slopes less than 4 percent: 0 to 1 percent

Major Component Description

Telstad

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)

Figure 5.—Field windbreaks on map unit 503B,Telstad-Joplin loams, 0 to 4 percent slopes.

Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.9 inches

Joplin

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.2 inches

Thibadeau Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Oxyaquic Ustifluvents

Typical Pedon

Thibadeau clay loam, 0 to 2 percent slopes, in an area of rangeland; 1,600 feet north and 600 feet east of the southwest corner of sec. 11, T. 35 N., R. 12 E.

A—0 to 2 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak very fine granular structure; soft, very friable, sticky and plastic; many very fine roots; common very fine pores; strongly alkaline; clear smooth boundary.

C—2 to 14 inches; grayish brown (2.5Y 5/2) clay loam consisting of thin strata of loam and fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, sticky and plastic; many very fine roots; common very fine pores; strongly effervescent; strongly alkaline; clear wavy boundary.

Cyz—14 to 60 inches; light olive brown (2.5Y 5/4) clay loam consisting of thin strata of loam and fine sandy loam, olive brown (2.5Y 4/4) moist; many fine distinct yellowish brown (10YR 5/6) redox concentrations; massive; hard, friable, sticky and plastic; few very fine roots; common very fine pores; common fine masses and seams of gypsum and other salts; strongly effervescent; very strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; depth to water table is 24 to 42 inches

A horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 3, 4, or 5 moist
Chroma—2, 3, or 4
Clay content—27 to 40 percent
Electrical conductivity—8 to 16 mmhos/cm
Sodium adsorption ratio—8 to 20
Reaction—pH 7.9 to 9.6

C horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay loam, loam, or silty clay loam with or without thin strata of loam, clay loam, silty clay loam, fine sandy loam, or silt loam
Clay content—18 to 35 percent
Electrical conductivity—8 to 16 mmhos/cm
Sodium adsorption ratio—13 to 20
Reaction—pH 7.9 to 9.6

Cyz horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 or 4
Texture—Clay loam, loam or silty clay loam with or without thin strata of fine sandy loam, loam, clay loam, silty clay loam, or silt loam
Clay content—18 to 35 percent
Electrical conductivity—8 to 16 mmhos/cm
Sodium adsorption ratio—13 to 30
Gypsum—2 to 5 percent
Reaction—pH 7.9 to 9.6

99A—Thibadeau clay loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Thibadeau and similar soils: 85 percent

Minor Components

Poorly drained soils: 0 to 10 percent
Lostriver and similar soils: 0 to 1 percent
Bullhook and similar soils: 0 to 1 percent
Thibadeau, frequently flooded: 0 to 1 percent
Soils that have slopes more than 2 percent: 0 to 1 percent
Hanly and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 8.4 inches

Thoeny Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (0.06 inch/hour)
Landform: Till plains
Parent material: Glacial till
Slope range: 0 to 4 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Thoeny loam, in an area of Thoeny-Elloam complex, 0 to 4 percent slopes, in rangeland; 2,600 feet south and 1,600 feet east of the northwest corner of sec. 23, T. 36 N., R. 10 E.

E1—0 to 3 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak very thin platy structure parting to strong very fine granular; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; few very fine pores; mildly alkaline; clear smooth boundary.

E2—3 to 6 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak very thin platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine pores; mildly alkaline; abrupt smooth boundary.

Btn1—6 to 10 inches; pale brown (10YR 6/3) clay, dark brown (10YR 4/3) moist; moderate medium columnar structure parting to moderate medium angular blocky; very hard, firm, very sticky and very plastic; common very fine roots; many very fine pores; many distinct clay films on faces of peds; strongly alkaline; clear smooth boundary.

Btn2—10 to 14 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, firm, very sticky and very plastic; many very fine roots; common very fine pores; many distinct clay films on faces of peds; strongly alkaline; clear wavy boundary.

Bkn1—14 to 20 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; moderate medium subangular structure; very hard, firm, sticky and plastic; common very fine roots; many very fine pores; many very fine and fine masses of lime; violently effervescent; strongly alkaline; gradual smooth boundary.

Bkn2—20 to 27 inches; light gray (5Y 7/2) clay loam, light olive gray (5Y 6/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; many very fine pores; many very fine and fine masses of lime; violently effervescent; strongly alkaline; gradual smooth boundary.

Bkny—27 to 60 inches; light olive gray (5Y 6/2) clay loam, olive gray (5Y 5/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; many very fine pores; few fine and medium soft masses and threads of lime; few fine masses of gypsum; violently effervescent; strongly alkaline.

Range in Characteristics

Depth to the Bk horizon: 12 to 20 inches
Depth to the Bky horizon: 24 to 36 inches

E horizon
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Clay content—15 to 27 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles and stones, 0 to 10 percent pebbles

Electrical conductivity—0 to 4 mmhos/cm
Reaction—pH 5.6 to 7.8

Btn horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Clay or clay loam
Clay content—35 to 50 percent
Sodium adsorption ratio—5 to 20
Electrical conductivity—4 to 8 mmhos/cm
Skeletans: Unstained sand and silt grains range from very few to common faint on vertical faces of peds
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles and stones, 0 to 10 percent pebbles
Structure—Strong to medium columnar, prismatic, or blocky
Reaction—pH 7.4 to 9.0

Bkn horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Texture—Clay or clay loam
Clay content—35 to 50 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles and stones, 0 to 10 percent pebbles
Electrical conductivity—4 to 8 mmhos/cm
Sodium adsorption ratio—13 to 25 or more exchangeable magnesium plus sodium than calcium plus exchange acidity
Calcium carbonate equivalent—5 to 10 percent
Reaction—pH 7.4 to 9.0

Bkny horizon
Hue—2.5Y or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2 or 3
Texture—Clay or clay loam
Clay content—35 to 50 percent
Bulk density—1.55 gr/ccm and greater
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles and stones, 0 to 10 percent pebbles
Electrical conductivity—4 to 16 mmhos/cm
Sodium adsorption ratio—13 to 25 or more exchangeable magnesium plus sodium than calcium plus exchange acidity
Gypsum—1 to 3 percent
Reaction—pH 7.9 to 9.0

115B—Thoeny-Elloam complex, 0 to 4 percent slopes

Setting

Landform: Thoeny—till plains; Elloam—till plains
Position on landform: Thoeny—microhighs; Elloam—microlows
Slope: Thoeny—0 to 4 percent; Elloam—0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Thoeny and similar soils: 50 percent
Elloam and similar soils: 35 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Absher and similar soils: 0 to 8 percent
Hillon and similar soils: 0 to 4 percent
Soils that have slopes more than 4 percent: 0 to 2 percent

Major Component Description

Thoeny

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 7.4 inches

Elloam

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.5 inches

Tinsley Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Kames and eskers
Parent material: Glacial outwash
Slope range: 2 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Typic Ustorthents

Typical Pedon

Tinsley gravelly sandy loam, in an area of Attewan-Tinsley complex, 2 to 8 percent slopes, in rangeland; 2,700 feet south and 800 feet west of the northeast corner of sec. 28, T. 32 N., R. 15 E.

A—0 to 7 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, nonsticky and slightly plastic; many coarse and fine roots; few fine pores; 15 percent pebbles; strongly effervescent; moderately alkaline; clear wavy boundary.
C1—7 to 13 inches; grayish brown (10YR 5/2) very gravelly loamy sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; loose, nonsticky and nonplastic; many coarse and fine roots; few fine pores; 45 percent pebbles, 5 percent cobbles; strongly effervescent; moderately alkaline; gradual wavy boundary.
C2—13 to 40 inches; light gray (10YR 7/2) extremely gravelly sand, light brownish gray (10YR 6/2) moist; single grain; loose, nonsticky and nonplastic; common fine roots; few very fine pores; 45 percent pebbles, 25 percent cobbles; violently effervescent; moderately alkaline; gradual wavy boundary.
C3—40 to 60 inches; light brownish gray (10YR 6/2) very gravelly sand, grayish brown (10YR 5/2) moist; single grained; loose, nonsticky and nonplastic; few fine roots; 35 percent pebbles, 5 percent cobbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 12 and 35 inches; frozen November through March

A horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry; 3 or 4 moist
Chroma—2, 3, or 4
Clay content—5 to 10 percent
Content of rock fragments—15 to 35 percent—0 to 10 percent stones and cobbles, 15 to 25 percent pebbles
Reaction—pH 7.4 to 8.4

C horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Sand or loamy sand
Clay content—0 to 10 percent
Content of rock fragments—35 to 70 percent—5 to 25 percent stones and cobbles, 30 to 45 percent pebbles
Reaction—pH 7.4 to 8.4.

Twilight Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Sedimentary plains
Parent material: Semiconsolidated, sandy sedimentary beds
Slope range: 2 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-loamy, mixed Aridic Ustochrepts

Typical Pedon

Twilight fine sandy loam, in an area of Twilight-Blacksheep fine sandy loams, 2 to 8 percent slopes, in cropland; 1,700 feet south and 2,000 feet west of the northeast corner of sec. 10, T. 32 N., R. 11 E.

Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; neutral; abrupt smooth boundary.
Bw—6 to 14 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to weak very fine granular; slightly hard, very friable,

nonsticky and nonplastic; common fine and very fine roots; neutral; clear wavy boundary.

Bk1—14 to 24 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—24 to 29 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many fine masses of lime; violently effervescent; moderately alkaline; abrupt wavy boundary.

Cr—29 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated sandstone, grayish brown (2.5Y 5/2) moist; violently effervescent; moderately alkaline.

Range in Characteristics

Control section: 0 to 29 inches
Content of clay in the control section: 5 to 18 percent
Depth to Cr horizon: 20 to 40 inches

A horizon
Hue—10YR or 2.5Y
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Clay content—5 to 18 percent
Reaction—pH 6.6 to 7.8

Bw horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 to 4
Texture—Fine sandy loam or sandy loam
Clay content—5 to 18 percent
Reaction—pH 6.6 to 7.8

Bk horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—1, 2, 3, or 4
Texture—Fine sandy loam or sandy loam
Clay content—5 to 18 percent
Calcium carbonate equivalent—5 to 10 percent
Reaction—pH 7.4 to 8.4

661C—Twilight-Blacksheep fine sandy loams, 2 to 8 percent slopes

Setting

Landform: Twilight—sedimentary plains; Blacksheep—sedimentary plains
Position on landform: Twilight—back slopes; Blacksheep—shoulders
Slope: Twilight—2 to 8 percent; Blacksheep—2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Twilight and similar soils: 55 percent
Blacksheep and similar soils: 30 percent

Minor Components

Busby and similar soils: 0 to 3 percent
Yetull, calcareous soils: 0 to 2 percent
Very shallow soils: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 8 percent

Major Component Description

Twilight

Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 4.1 inches

Blacksheep

Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 2.5 inches

Vida Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains and hills
Parent material: Glacial till
Slope range: 0 to 25 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Vida clay loam, in an area of Bearpaw-Vida clay loams, 0 to 4 percent slopes, in cropland; 2,150 feet south and 2,200 feet west of the northeast corner of sec. 21, T. 30 N., R. 15 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; hard, friable, sticky and very plastic; many fine roots; common fine pores; neutral; clear smooth boundary.

Bt—5 to 8 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong medium prismatic structure parting to strong fine and medium subangular blocky; extremely hard, extremely firm, very sticky and very plastic; many very fine roots; many very fine pores; many faint clay films on faces of peds and lining pores; neutral; clear smooth boundary.

Bk1—8 to 23 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky and very plastic; many very fine roots; many very fine pores; common fine soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—23 to 42 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak fine and medium subangular structure; very hard, very firm, very sticky and very plastic; common very fine roots; many very fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk3—42 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak fine and medium subangular structure; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine pores; few fine soft masses of lime; strongly effervescent; strongly alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 10 inches
Depth to the Bk horizon: 6 to 10 inches

Ap horizon
Value—3 or 4 dry, 2 or 3 moist
Chroma—2 or 3
Texture—Loam or clay loam
Clay content—15 to 30 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles and stones, 0 to 10 percent pebbles
Reaction—pH 6.6 to 7.8

Bt horizon
Hue—10YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Loam, clay loam, or clay
Clay content—25 to 35 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Reaction—pH 6.6 to 7.8

Bk1 horizon
Hue—10YR or 2.5Y
Value—6 or 7 dry; 5 or 6 moist
Chroma—2 or 3
Texture—Loam or clay loam
Clay content—25 to 35 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.4 to 8.4

Bk2 and Bk3 horizons
Hue—10YR or 2.5Y
Value—6 or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—25 to 35 percent

Content of rock fragments—0 to 15 percent—
0 to 5 percent cobbles, 0 to 10 percent pebbles
Calcium carbonate equivalent—2 to 12 percent
Gypsum—0 to 5 percent
Reaction—pH 7.9 to 8.4

696C—Vida-Zahill-Bearpaw clay loams, 2 to 8 percent slopes

Setting

Landform: Vida—till plains; Zahill—till plains; Bearpaw—till plains
Position on landform: Vida—back slopes; Zahill—shoulders; Bearpaw—foot slopes
Slope: Vida—2 to 8 percent; Zahill—2 to 8 percent; Bearpaw—2 to 8 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Vida and similar soils: 35 percent
Zahill and similar soils: 30 percent
Bearpaw and similar soils: 20 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Williams and similar soils: 0 to 9 percent
Zahill gravelly loam: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Vida

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 8.1 inches

Zahill

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

Bearpaw

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.3 inches

Waltham Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (0.06 inch/hour)
Landform: Till plains
Parent material: Glacial till
Slope range: 0 to 4 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Waltham clay loam, in an area of Bearpaw-Waltham clay loams, 0 to 4 percent slopes, in rangeland; 500 feet north and 200 feet west of the southeast corner of sec. 4, T. 31 N., R. 16 E.

E—0 to 2 inches; light gray (10YR 7/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine platy structure; hard, firm, sticky and plastic; common very fine and fine roots; common very fine and fine pores; mildly alkaline; abrupt smooth boundary.
Bt—2 to 10 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong medium and coarse columnar structure parting to strong fine and medium subangular blocky; very hard, very firm, very sticky and very plastic; common very fine and fine roots; common very fine and fine pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.
Btkn—10 to 17 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to strong fine and medium subangular blocky; very hard, firm, very sticky and very plastic; few very fine and fine roots; common very fine and fine pores; few faint clay films on faces of peds; common fine

soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bknyz1—17 to 25 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine and fine roots; common very fine and fine pores; many fine soft masses of lime; common fine masses of gypsum and other salts; strongly effervescent; moderately alkaline; clear smooth boundary.

Bknyz2—25 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine pores; many fine soft masses of lime; many fine masses of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to the Btkn horizon: 10 to 16 inches
Depth to the Bknyz horizon: 16 to 35 inches

E horizon
Hue—2.5Y or 10YR
Value—6 or 7 dry; 4 or 5 moist
Chroma—2 or 3
Clay content—27 to 40 percent
Content of rock fragments—0 to 5 percent pebbles
Electrical conductivity—0 to 2 mmhos/cm
Sodium adsorption ratio—0 to 4
Reaction—pH 6.6 to 8.4
Other features—In some pedons there is a 1- or 2-inch A horizon with granular structure above the E horizon

Bt horizon
Hue—2.5Y or 10YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Clay loam or clay
Clay content—45 to 60 percent
Content of rock fragments—0 to 5 percent pebbles
Electrical conductivity—0 to 2 mmhos/cm
Sodium adsorption ratio—4 to 13
Reaction—pH 7.4 to 8.4

Btkn horizon
Hue—2.5Y or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay loam or clay
Clay content—35 to 45 percent
Content of rock fragments—0 to 5 percent mainly pebbles
Electrical conductivity—0 to 4 mmhos/cm
Sodium adsorption ratio—13 to 25
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.9 to 9.0

Bkny horizon
Hue—2.5Y or 10YR
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay loam
Clay content—27 to 40 percent
Content of rock fragments—0 to 5 percent pebbles
Electrical conductivity—4 to 16 mmhos/cm
Sodium adsorption ratio—4 to 20
Gypsum—3 to 5 percent
Calcium carbonate equivalent—5 to 10 percent
Reaction—pH 7.4 to 9.0

Warwood Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Mountains
Parent material: Colluvium
Slope range: 15 to 45 percent
Annual precipitation: 20 to 22 inches
Annual air temperature: 38 to 40 degrees F
Frost-free period: 50 to 70 days

Taxonomic Class: Fine-loamy, mixed Glossic Cryoboralfs

Typical Pedon

Warwood loam, 15 to 45 percent slopes, in a woodland area; 1,100 feet south and 1,800 feet west of the northeast corner of sec. 22, T. 28 N., R. 16 E.

Oi—3 inches to 0; forest litter of slightly decomposed needles, twigs, and leaves.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate fine granular; soft, very friable, slightly sticky and slightly plastic; many fine and very fine and few medium and coarse roots; many fine and very fine pores; slightly acid; clear wavy boundary.

E—4 to 10 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; moderate fine

subangular blocky structure parting to moderate fine granular; slightly hard, very friable, nonsticky and nonplastic; common fine and many very fine roots; many very fine pores; slightly acid; clear wavy boundary.

E/Bt—10 to 15 inches; 80 percent light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist tongues (E part); 20 percent grayish brown (10YR 5/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist (Bt part); moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine and common fine pores; common faint clay films in pores and bridging sand grains; slightly acid; clear wavy boundary.

Bt/E—15 to 20 inches; 60 percent is grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist tongues (Bt part); 40 percent is light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist (E part); moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine and common fine pores; common distinct clay films on faces of peds and in pores of Bt part; slightly acid; clear wavy boundary.

Bt1—20 to 45 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong medium prismatic structure parting to strong medium angular blocky; very hard, firm, sticky and plastic; common very fine roots; many very fine pores; many distinct clay films on faces of peds; neutral; gradual wavy boundary.

Bt2—45 to 60 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure; very hard, friable, sticky and plastic; few very fine roots; many very fine pores; few faint clay films on faces of peds; neutral.

Range in Characteristics

Depth to the argillic horizon: 4 to 20 inches

A horizon

Value—4 or 5 dry; 2 or 3 moist
Clay content—20 to 27 percent
Content of rock fragments—5 to 15 percent—5 to 10 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 5.6 to 6.5

E horizon

Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Loam or sandy loam
Clay content—15 to 27 percent
Content of rock fragments—5 to 15 percent—5 to 15 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 5.6 to 6.5

E/Bt horizon

Value—E part—5 or 6 dry and 4 moist; Bt part—4 or 5 dry and 3 or 4 moist
Chroma—2 or 3
Texture—Sandy loam, loam, or sandy clay loam (mixed)
Clay content—18 to 30 percent
Content of rock fragments—5 to 15 percent—5 to 15 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 5.6 to 6.5

Bt/E horizon

Value—Bt part—4 or 5 dry and 3 or 4 moist; E part—5 or 6 dry and 4 moist
Chroma—2 or 3
Texture—Sandy clay loam or clay loam (mixed)
Clay content—20 to 35 percent
Content of rock fragments—5 to 15 percent—5 to 15 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 5.6 to 6.5

Bt1 horizon

Value—5 or 6 dry; 3 or 4 moist
Chroma—2 or 3
Clay content—27 to 35 percent
Content of rock fragments—5 to 25 percent—5 to 20 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 6.1 to 7.3

Bt2 horizon

Value—5 or 6 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Clay loam or sandy clay loam
Clay content—20 to 35 percent
Content of rock fragments—5 to 25 percent—5 to 20 percent pebbles, 0 to 5 percent cobbles
Reaction—pH 6.1 to 7.3

530F—Warwood loam, 15 to 45 percent slopes

Setting

Landform: Mountains
Slope: 15 to 45 percent
Mean annual precipitation: 20 to 22 inches
Frost-free period: 50 to 70 days

Composition

Major Components

Warwood and similar soils: 85 percent

Minor Components

Elkner and similar soils: 0 to 3 percent
Garlet and similar soils: 0 to 3 percent
Soils that are 20 to 40 inches to rock: 0 to 3 percent
Soils that have slopes more than 45 percent: 0 to 1 percent
Soils that have slopes less than 15 percent: 0 to 4 percent
Areas of rubble land: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: About 9.4 inches

W—Water

Composition

Major Components

Water: 100 percent

Major Component Description

Definition: Areas of open water

Weingart Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains
Parent material: Semiconsolidated shale residuum
Slope range: 2 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Weingart clay, in an area of Weingart complex, 2 to 8 percent slopes, in rangeland; 2,000 feet south and 2,200 feet west of the northeast corner of sec. 13, T. 30 N., R. 11 E.

E—0 to 2 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate very fine platy structure parting to weak very fine granular; slightly hard, friable, sticky and plastic; many very fine roots; few very fine pores; mildly alkaline; clear smooth boundary.
Btn—2 to 10 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm, very sticky and very plastic; many very fine roots; common very fine pores; violently effervescent; strongly alkaline; clear smooth boundary.
Bknyz—10 to 16 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; extremely hard, extremely firm, very sticky and very plastic; many very fine roots; few very fine pores; many fine soft threads of lime; many fine threads of gypsum and other salts; violently effervescent; moderately alkaline; clear smooth boundary.
Bnyz—16 to 22 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; extremely hard, extremely firm, very sticky and very plastic; common very fine roots; few very fine pores; moderately alkaline; clear smooth boundary.
Cr—22 to 60 inches; olive (5Y 4/4) semiconsolidated shale, olive gray (5Y 4/2) moist; few fine threads of gypsum; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature is 41 degrees F or above
Depth to Bk horizon: 8 to 16 inches
Depth to gypsum and other salts: 10 to 24 inches
Depth to Cr horizon: 20 to 40 inches

E horizon
Hue—10YR or 2.5Y
Value—5, 6, or 7 dry; 3, 4, 5, or 6 moist
Chroma—2 or 3
Texture—Clay or clay loam
Clay content—27 to 45 percent

Content of rock fragments—0 to 10 percent—0 to 10 percent stones and cobbles, 0 to 5 percent hard shale, 0 to 5 percent soft shale
Reaction—pH 5.6 to 7.8

Btn horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Clay, silty clay, or sandy clay
Clay content—40 to 60 percent
Content of rock fragments—0 to 10 percent—0 to 5 percent hard shale, 0 to 5 percent soft shale
Electrical conductivity—2 to 8 mmhos/cm
Sodium adsorption ratio—10 to 30
Reaction—pH 6.6 to 9.0

Bknyz horizon
Hue—2.5Y or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—1, 2, 3, or 4
Texture—Clay, silty clay, clay loam, or silty clay loam
Clay content—35 to 55 percent
Content of rock fragments—0 to 10 percent—0 to 5 percent hard shale, 0 to 5 percent soft shale
Electrical conductivity—4 to 16 mmhos/cm
Sodium adsorption ratio—13 to 30
Gypsum—1 to 5 percent
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.9 to 9.6

Bnyz horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—1, 2, 3, or 4
Texture—Clay, silty clay, clay loam, or silty clay loam
Clay content—35 to 55 percent
Content of rock fragments—60 to 75 percent—5 to 30 percent hard shale, 45 to 55 percent soft shale
Electrical conductivity—4 to 16 mmhos/cm
Sodium adsorption ratio—13 to 30
Gypsum—1 to 5 percent
Reaction—pH 7.9 to 9.6

Cr horizon
Material: Mostly semiconsolidated shale with some interbedded shale and sandstone

62C—Weingart complex, 2 to 8 percent slopes

Setting

Landform: Weingart—sedimentary plains; Weingart, thin surface—sedimentary plains
Position on landform: Weingart—microhighs; Weingart, thin surface—microlows
Slope: Weingart—2 to 8 percent; Weingart, thin surface—2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Weingart and similar soils: 50 percent
Weingart, thin surface and similar soils: 35 percent

Minor Components

Creed and similar soils: 0 to 5 percent
Bascovy and similar soils: 0 to 2 percent
Neldore and similar soils: 0 to 3 percent
Hillon and similar soils: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Weingart

Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 2.7 inches

Weingart, thin surface

Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches
Available water capacity: About 2.5 inches

Wheatbelt Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Poorly drained
Permeability: Very slow (0.06 inch/hour)
Landform: Lake plains
Parent material: Glaciolacustrine deposits
Slope range: 0 to 1 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Very-fine, montmorillonitic, frigid Sodic Epiaquerts

Typical Pedon

Wheatbelt clay, 0 to 1 percent slopes, in an area of rangeland; 2,300 feet north and 2,100 feet west of the southeast corner of sec. 17, T. 37 N., R. 13 E.

Ag—0 to 2 inches; gray (5Y 5/1) clay, very dark gray (5Y 3/1) moist; strong very coarse granular structure; extremely hard, extremely firm, very sticky and very plastic; few very fine roots; few very fine pores; moderately alkaline; clear smooth boundary.

Bnssg—2 to 16 inches; gray (5Y 5/1) clay, very dark gray (5Y 3/1) moist; moderate very fine and fine angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; few very fine roots; few very fine pores; common slickensides intersecting at 30 to 45 degrees from horizontal; strongly alkaline; clear wavy boundary.

Bnssyg1—16 to 38 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; moderate fine and medium angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; few very fine pores; common slickensides intersecting at 30 to 45 degrees from horizontal; many fine masses of gypsum; strongly alkaline; gradual wavy boundary.

Bnssyg2—38 to 60 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; moderate fine and medium angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; few very fine pores; many slickensides intersecting at 30 to 60 degrees from horizontal; common fine masses of gypsum; strongly alkaline.

Range in Characteristics

Soil temperature: 44 to 47 degrees F
Moisture control section: Between 4 and 12 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees or higher
Depth to Bnssg horizon: 1 to 30 inches
Depth to Bnssyzg horizon: 5 to 30 inches
Water table: Ponded, +0.5 to 1.0 foot during part of the growing season in most years
Other features: When dry, this soil has cracks that are at least 1/2 inch wide at a depth of 20 inches; some pedons have a Bng horizon

Ag horizon
Value—5 dry; 2.5, 3, or 4 moist
Clay content—60 to 85 percent
Electrical conductivity—2 to 8 mmhos/cm
Sodium adsorption ratio—4 to 13
Reaction—pH 7.9 to 9.0

Bnssg horizon
Value—4 or 5 dry; 2.5 or 3 moist
Texture—Clay or silty clay
Clay content—60 to 85 percent
Electrical conductivity—2 to 8 mmhos/cm
Sodium adsorption ratio—13 to 30
Reaction—pH 7.9 to 9.0

Bnssyg horizon
Value—4 or 5 dry; 2.5, 3, or 4 moist
Texture—Clay or silty clay
Clay content—60 to 85 percent
Electrical conductivity—8 to 16 mmhos/cm
Sodium adsorption ratio—13 to 30
Gypsum—2 to 5 percent
Calcium carbonate equivalent—0 to 2 percent
Reaction—pH 7.9 to 9.0

51A—Wheatbelt clay, 0 to 1 percent slopes

Setting

Landform: Lake plains
Slope: 0 to 1 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Wheatbelt and similar soils: 85 percent

Minor Components

Soils with loamy layers below 40 inches: 0 to 6 percent
McKenzie and similar soils: 0 to 5 percent
Soils that have slopes more than 1 percent: 0 to 1 percent
Marvan, saline soils: 0 to 3 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Ponding: Long
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 7.0 inches

Whitlash Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Hills and mountains
Parent material: Igneous rocks
Slope range: 15 to 70 percent
Annual precipitation: 13 to 22 inches
Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 110 days

Taxonomic Class: Loamy-skeletal, mixed Lithic Haploborolls

Typical Pedon

Whitlash gravelly loam, in an area of Belain-Whitlash, moist-Hedoes complex, 15 to 60 percent slopes, in rangeland; 2,200 feet south and 2,300 feet west of the northeast corner of sec. 24, T. 29 N., R. 14 E.

A—0 to 2 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and plastic; many very fine roots; many very fine pores; 15 percent pebbles; neutral; clear smooth boundary.

Bw1—2 to 7 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; soft, very friable, sticky and plastic; many very fine roots; many very fine pores; 20 percent pebbles; neutral; clear wavy boundary.

Bw2—7 to 17 inches; grayish brown (10YR 5/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and plastic; common very fine roots; 45 percent pebbles; neutral; abrupt wavy boundary.

R—17 inches; igneous rock.

Range in Characteristics

Depth to bedrock: 10 to 20 inches

A horizon
Value—3 or 4 dry; 2 or 3 moist
Chroma—1, 2, or 3
Texture—Loam or sandy loam
Clay content—10 to 27 percent and less than 35 percent fine and coarser sand
Content of rock fragments—15 to 35 percent—15 to 20 percent pebbles or channers, 0 to 15 percent cobbles, flagstones, or stones
Reaction—pH 6.1 to 7.3

Bw horizon
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3
Texture—Loam, sandy clay loam, or sandy loam
Clay content—10 to 27 percent and less than 35 percent fine and coarser sand
Content of rock fragments—35 to 80 percent—15 to 60 percent pebbles or channers, 5 to 50 percent cobbles, flagstones, or stones
Reaction—pH 6.1 to 7.3
Other features—Some pedons have a C horizon

892F—Whitlash-Belain-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform: Whitlash—hills; Belain—hills; Rock outcrop—hills
Position on landform: Whitlash—shoulders; Belain—back slopes; Rock outcrop—shoulders
Slope: Whitlash—25 to 60 percent; Belain—25 to 45 percent

Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Whitlash and similar soils: 35 percent
Belain and similar soils: 30 percent
Rock outcrop: 20 percent

Minor Components

Soils with ponderosa pine: 0 to 5 percent
Hedoes and similar soils: 0 to 3 percent
Whitlash stony sandy loam: 0 to 5 percent
Areas of rubble land: 0 to 2 percent

Major Component Description

Whitlash

Surface layer texture: Gravelly sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 1.4 inches

Belain

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.5 inches

Rock outcrop

Definition: Exposures of igneous and metamorphic bedrock
Flooding: None

895F—Whitlash-Perma-Rock outcrop complex, 25 to 70 percent slopes

Setting

Landform: Whitlash—mountains; Perma—mountains; Rock outcrop—mountains
Position on landform: Whitlash—shoulders; Perma—back slopes; Rock outcrop—shoulders
Slope: Whitlash—25 to 70 percent; Perma—25 to 70 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Whitlash and similar soils: 35 percent
Perma and similar soils: 30 percent
Rock outcrop: 20 percent

Minor Components

Hedoes and similar soils: 0 to 2 percent
Belain and similar soils: 0 to 5 percent
Soils that have slopes less than 25 percent: 0 to 6 percent
Soils that have slopes more than 70 percent: 0 to 1 percent
Areas of rubble land: 0 to 1 percent

Major Component Description

Whitlash

Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 1.7 inches

Perma

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 4.1 inches

Rock outcrop

Definition: Exposures of igneous and metamorphic bedrock
Flooding: None

Williams Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Till plains
Parent material: Glacial till
Slope range: 0 to 8 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Williams loam, in an area of Williams-Vida loams, 0 to 4 percent slopes, in rangeland; 500 feet north and 550 west of the southeast corner of sec. 24, T. 30 N., R. 16 E.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak medium angular blocky structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine pores; neutral; clear smooth boundary.

Bt1—4 to 9 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; many very fine and fine roots; many very fine pores; common faint clay films on faces of peds; neutral; clear wavy boundary.

Bt2—9 to 14 inches; dark brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common fine and medium roots; many very fine pores; common faint clay films on faces of peds; neutral; clear wavy boundary.

Bk1—14 to 23 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots; common very fine pores; common medium soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—23 to 41 inches; light gray (10YR 7/2) clay loam, light brownish gray (10YR 6/2) moist; moderate medium subangular blocky structure; hard; firm; sticky and plastic; few fine roots; common very fine pores; many medium soft masses and threads of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bky—41 to 60 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few very fine pores; common medium soft masses of lime; few fine masses of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches
Depth to the Bk horizon: 10 to 30 inches

A horizon
Value—3, 4, or 5 dry; 2 or 3 moist
Clay content—15 to 27 percent
Reaction—pH 6.6 to 7.8

Bt horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 2, 3, 4, or 5 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—24 to 35 percent clay
Reaction—pH 6.6 to 7.8

Bk horizon
Hue—10YR, 2.5Y, or 5Y
Value—4, 5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—22 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Reaction—pH 7.9 to 8.4

Bky horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—22 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum—1 to 3 percent
Reaction—7.9 to 8.4

801B—Williams-Vida loams, 0 to 4 percent slopes

Setting

Landform: Williams—till plains; Vida—till plains
Position on landform: Williams—foot slopes; Vida—back slopes
Slope: Williams—0 to 4 percent; Vida—0 to 4 percent

Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Williams and similar soils: 60 percent
Vida and similar soils: 25 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Zahill and similar soils: 0 to 8 percent
Obrien and similar soils: 0 to 2 percent
Bearpaw and similar soils: 0 to 1 percent
Soils that have slopes more than 4 percent: 0 to 3 percent

Major Component Description

Williams

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.4 inches

Vida

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 8.2 inches

801C—Williams-Vida loams, 4 to 8 percent slopes

Setting

Landform: Williams—till plains; Vida—till plains
Position on landform: Williams—foot slopes; Vida—back slopes
Slope: Williams—4 to 8 percent; Vida—4 to 8 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Williams and similar soils: 55 percent
Vida and similar soils: 30 percent

Minor Components

Nishon and similar soils: 0 to 1 percent
Zahill and similar soils: 0 to 8 percent
Bearpaw and similar soils: 0 to 1 percent
Obrien and similar soils: 0 to 1 percent
Soils that have slopes less than 4 percent: 0 to 1 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Williams

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.4 inches

Vida

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 8.2 inches

Winkler Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Mountains
Parent material: Colluvium
Slope range: 25 to 60 percent
Annual precipitation: 17 to 20 inches
Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, frigid Typic Ustochrepts

Typical Pedon

Winkler gravelly sandy loam, in an area of Winkler-Ambrant complex, 25 to 60 percent slopes, in woodland; 50 feet north and 900 feet east of the southwest corner of sec. 35, T. 29 N., R. 15 E.

Oi—3 to 0 inches; forest litter of slightly decomposed needles, twigs, and leaves.

E1—0 to 7 inches; light brownish gray (10YR 6/2) gravelly sandy loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure parting to moderate medium and fine granular; slightly hard, very friable, slightly sticky and slightly plastic; few coarse and many fine and medium roots; common fine pores; 20 percent pebbles; neutral; gradual wavy boundary.

E2—7 to 15 inches; light brownish gray (10YR 6/2) very gravelly sandy loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many medium and fine roots; common very fine pores; 40 percent pebbles; neutral; gradual wavy boundary.

E and Bt—15 to 33 inches; 75 percent is light brownish gray (10YR 6/2) extremely gravelly sandy loam, grayish brown (10YR 5/2) moist (E part); 25 percent is brown (10YR 5/3) sandy loam lamellae, brown (10YR 4/3) moist (Bt part); weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many medium and fine roots; common very fine pores; 55 percent pebbles, 10 percent cobbles; slightly acid; gradual wavy boundary.

C—33 to 60 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; 60 percent pebbles, 15 percent cobbles; neutral.

Range in Characteristics

E1 horizon

Hue—7.5YR or 10YR
Value—6, 7, or 8 dry; 5, 6, or 7 moist
Chroma—2, 3, or 4
Clay content—5 to 15 percent
Content of rock fragments—15 to 35 percent—0 to 5 percent angular cobbles, 10 to 30 percent angular pebbles
Reaction—pH 6.1 to 7.3

E2 horizon

Hue—2.5Y, 7.5YR, or 10YR
Value—6, 7, or 8 dry; 5, 6, or 7 moist
Chroma—2, 3, or 4
Texture—Sandy loam or loam
Clay content—5 to 15 percent
Content of rock fragments—35 to 70 percent—0 to 10 percent angular cobbles, 35 to 60 percent angular pebbles
Reaction—pH 5.6 to 7.3

E and Bt horizon

Hue—E part—2.5Y, 7.5YR, or 10YR; B part—2.5Y, 5YR, 7.5YR, or 10YR
Value—E part—6, 7, or 8 dry and 5, 6, or 7 moist; B part—4, 5, or 6 dry and 4 or 5 moist
Chroma—E part—2, 3, or 4; B part—3 or 4
Texture—Fine sandy loam, sandy loam, or loam
Clay content—5 to 15 percent, lamellae have less than 5 percent increase in clay
Content of rock fragments—60 to 85 percent—10 to 25 percent angular cobbles, 50 to 60 percent angular pebbles
Reaction—pH 5.6 to 6.5

C horizon

Hue—7.5YR or 10YR
Value—5, 6, or 7 dry; 4 or 5 moist
Chroma—2 or 3
Texture—Sandy loam or fine sandy loam
Clay content—5 to 15 percent
Content of rock fragments—60 to 85 percent—10 to 25 percent angular cobbles, 50 to 60 percent angular pebbles
Reaction—pH 5.6 to 7.3

191F—Winkler-Ambrant complex, 25 to 60 percent slopes

Setting

Landform: Winkler—mountains; Ambrant—mountains; Winkler, dry—mountains
Position on landform: Winkler—back slopes; Ambrant—back slopes; Winkler, dry—back slopes
Slope: Winkler—25 to 60 percent; Ambrant—25 to 60 percent; Winkler, dry—25 to 60 percent
Mean annual precipitation: 17 to 20 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 35 percent
Ambrant and similar soils: 25 percent
Winkler, dry and similar soils: 25 percent

Minor Components

Winkler loam: 0 to 6 percent
Soils with bedrock at less than 60 inches: 0 to 7 percent
Soils that have slopes more than 60 percent: 0 to 1 percent
Areas of rubble land: 0 to 1 percent

Major Component Description

Winkler

Surface layer texture: Gravelly sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: About 2.9 inches

Ambrant

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: About 4.2 inches

Winkler, dry

Surface layer texture: Gravelly sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: About 2.9 inches

Yamacall Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans and sedimentary plains
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed, frigid Aridic Ustochrepts

Typical Pedon

Yamacall loam, 0 to 4 percent slopes, in an area of cropland; 1,100 feet north and 350 feet east of the southwest corner of sec. 22, T. 32 N., R. 16 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine and medium granular structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—6 to 18 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—18 to 40 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; common medium and fine soft masses of lime; violently effervescent; strongly alkaline; gradual wavy boundary.

Bk2—40 to 60 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; common fine soft masses of lime; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches
Depth to Bk horizon: 10 to 20 inches

Ap horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 3, 4, or 5 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—18 to 35 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Reaction—pH 7.4 to 8.4

Bw horizon
Hue—10YR, 2.5Y, or 5Y

Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam, clay loam, or silt loam
Clay content—18 to 35 percent with 15 to 35 percent fine sand and coarser
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Effervescence—None to strong
Reaction—pH 6.6 to 8.4

Bk horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam, clay loam, or silt loam
Clay content—18 to 35 percent with 15 to 35 percent fine sand and coarser
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Electrical conductivity—0 to 4 mmhos/cm
Calcium carbonate equivalent—5 to 15 percent
Effervescence—Strong or violent
Reaction—pH 7.9 to 9.0

799C—Yamacall clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Kobase, calcareous soils: 0 to 2 percent
Yamacall loam soils: 0 to 8 percent
Benz and similar soils: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.3 inches

79B—Yamacall loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 4 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Kremlin and similar soils: 0 to 5 percent
Havre, rarely flooded: 0 to 1 percent
Marvan and similar soils: 0 to 4 percent
Soils that have slopes more than 4 percent: 0 to 3 percent
Yamacall clay loam soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.3 inches

795C—Yamacall-Benz clay loams, 2 to 8 percent slopes

Setting

Landform: Yamacall—alluvial fans; Benz—alluvial fans
Slope: Yamacall—2 to 8 percent; Benz—2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Yamacall and similar soils: 50 percent
Benz and similar soils: 35 percent

Minor Components

Kobase, calcareous soils: 0 to 3 percent
Marvan and similar soils: 0 to 4 percent
Delpoint, calcareous soils: 0 to 2 percent

Yamacall loam: 0 to 5 percent
Soils that have slopes more than 8 percent: 0 to 1 percent

Major Component Description

Yamacall

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.3 inches

Benz

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: About 6.4 inches

791C—Yamacall-Hillon loams, 2 to 8 percent slopes

Setting

Landform: Yamacall—sedimentary plains; Hillon—till plains
Position on landform: Yamacall—back slopes; Hillon—back slopes
Slope: Yamacall—2 to 8 percent; Hillon—2 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Yamacall and similar soils: 50 percent
Hillon and similar soils: 35 percent

Minor Components

Busby and similar soils: 0 to 10 percent
Joplin and similar soils: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 2 percent

Major Component Description

Yamacall

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.3 inches

Hillon

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 10.0 inches

Yawdim Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Hills
Parent material: Semiconsolidated shale residuum
Slope range: 8 to 25 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Clayey, montmorillonitic (calcareous), frigid, shallow Aridic Ustorthents

Typical Pedon

Yawdim clay, in an area of Cabbart-Yawdim complex, 8 to 25 percent slopes, in rangeland; 50 feet north and 2,500 feet west of the southeast corner of sec. 23, T. 29 N., R. 8 E.

A—0 to 2 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, firm, very sticky and plastic; common very fine roots; few very fine pores; slightly effervescent; mildly alkaline; clear smooth boundary.

C1—2 to 11 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; hard, firm, very sticky and plastic; common very fine roots; common very fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—11 to 15 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong very thin and thin platy structure; slightly hard, firm, very sticky and plastic; common very fine roots; few very fine pores; 50 percent soft fine shale chips; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—15 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated shale, grayish brown (2.5Y 5/2) moist; few medium masses of gypsum; mildly alkaline.

Range in Characteristics

Depth to Cr horizon: 10 to 20 inches

A horizon
Hue—10YR or 2.5Y
Value—5 or 6 dry; 3 or 4 moist
Chroma—1 or 2
Clay content—40 to 50 percent
Reaction—pH 6.6 to 7.8

C horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma—1, 2, 3, or 4
Clay content—35 to 50 percent
Reaction—pH 7.4 to 8.4

Cr horizon
Material: Semiconsolidated shale

Yetull Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Till plains and hills
Parent material: Alluvium and eolian deposits
Slope range: 0 to 15 percent
Annual precipitation: 10 to 13 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 120 days

Taxonomic Class: Mixed, frigid Typic Ustipsamments

Typical Pedon

Yetull loamy fine sand, in an area of Yetull-Lonesome loamy fine sands, 0 to 8 percent slopes, in rangeland; 200 feet north and 600 feet west of the southeast corner of sec. 32, T. 30 N., R. 10 E.

A—0 to 8 inches; grayish brown (2.5Y 5/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; strong fine granular structure; soft, loose, nonsticky and nonplastic; many very fine and fine roots; many very fine pores; neutral; clear smooth boundary.

C1—8 to 23 inches; light brownish gray (2.5Y 6/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; many very fine roots; many very fine pores; violently effervescent; moderately alkaline; clear smooth boundary.

C2—23 to 37 inches; light yellowish brown (2.5Y 6/4) loamy fine sand, light olive brown (2.5Y 5/4) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine pores; violently effervescent; moderately alkaline; gradual smooth boundary.

C3—37 to 60 inches: light brownish gray (2.5Y 6/2) loamy sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; many very fine pores; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees
Moisture control section: Between 12 and 35 inches; dry in all parts between four-tenths and five-tenths of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher
Soil phase: Calcareous

A horizon
Hue—10YR to 2.5Y
Value—5 or 6 dry; 3 or 4 moist
Chroma—2, 3, or 4
Texture—Loamy fine sand or fine sandy loam
Clay content—0 to 10 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Calcium carbonate equivalent—0 to 10 percent
Effervescence—None to strong
Reaction—pH 6.6 to 8.4

C1 horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Sand, fine sand, loamy sand, loamy coarse sand, loamy fine sand, or coarse sand
Clay content—0 to 10 percent
Content of rock fragments—0 to 15 percent pebbles
Calcium carbonate equivalent—1 to 10 percent
Effervescence—Slight or strong
Reaction—pH 7.4 to 8.4

C2 horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Sand, fine sand, loamy sand, loamy coarse sand, loamy fine sand, or coarse sand
Clay content—0 to 10 percent
Content of rock fragments—0 to 15 percent pebbles
Calcium carbonate equivalent—3 to 10 percent
Effervescence—Slight, strong, or violent
Reaction—pH 7.4 to 8.4

C3 horizon
Hue—10YR or 2.5Y
Value—4, 5, or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Sand, fine sand, loamy sand, loamy coarse sand, loamy fine sand, or coarse sand
Clay content—0 to 10 percent
Effervescence—Strong or violent
Calcium carbonate equivalent—3 to 10 percent
Reaction—pH 7.4 to 8.4

701D—Yetull-Busby fine sandy loams, 4 to 15 percent slopes

Setting

Landform: Yetull—hills; Busby—hills
Position on landform: Yetull—back slopes; Busby—back slopes
Slope: Yetull—4 to 15 percent; Busby—4 to 15 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Yetull and similar soils: 45 percent
Busby and similar soils: 40 percent

Minor Components

Fortbenton and similar soils: 0 to 4 percent
Yamacall, calcareous soils: 0 to 3 percent
Tinsley and similar soils: 0 to 3 percent

Major Component Description

Yetull

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 4.2 inches

Busby

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 7.3 inches

732C—Yetull-Lonesome loamy fine sands, 0 to 8 percent slopes

Setting

Landform: Yetull—till plains; Lonesome—till plains
Position on landform: Yetull—back slopes; Lonesome—back slopes
Slope: Yetull—0 to 8 percent; Lonesome—0 to 8 percent
Mean annual precipitation: 10 to 13 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Yetull and similar soils: 45 percent
Lonesome and similar soils: 40 percent

Minor Components

Yetull, calcareous soils: 0 to 5 percent
Fortbenton and similar soils: 0 to 4 percent
Soils that have slopes more than 8 percent: 0 to 3 percent
Areas that are seeped: 0 to 1 percent
Areas of duneland: 0 to 1 percent
Blowout areas: 0 to 1 percent

Major Component Description

Yetull

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 3.6 inches

Lonesome

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian over till or lacustrine material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 7.7 inches

Zahill Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inches/hour) above 28 inches; slow (0.06 to 0.2 inches/hour) below this depth
Landform: Till plains and hills
Parent material: Glacial till
Slope range: 2 to 60 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Typic Ustorthents

Typical Pedon

Zahill clay loam, in an area of Zahill-Obrien clay loams, 15 to 60 percent slopes, in rangeland; 500 feet south and 900 feet west of the noutheast corner of sec. 2, T. 31 N., R. 17 E.

A—0 to 3 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 4/2) moist; weak very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; mildly alkaline; clear smooth boundary.

Bk1—3 to 14 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; common very fine roots; common very fine pores; common medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—14 to 28 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; few very fine roots; few very fine pores; common medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bky—28 to 60 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; few fine soft masses of lime; few fine masses of gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

A horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—20 to 35 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent cobbles and stones, 0 to 10 percent pebbles
Reaction—pH 7.4 to 8.4

Bk horizon
Hue—10YR, 2.5Y, or 5Y
Value—5, 6, or 7 dry; 4, 5, or 6 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—25 to 35 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent stones or cobbles, 0 to 10 percent pebbles
Calcium carbonate equivalent—8 to 15 percent
Effervescence—Strong or violent
Reaction—pH 7.4 to 8.4

Bky horizon
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—2, 3, or 4
Texture—Loam or clay loam
Clay content—20 to 35 percent
Content of rock fragments—0 to 15 percent—0 to 5 percent stones or cobbles, 0 to 10 percent pebbles
Effervescence—Slight or strong
Gypsum—1 to 5 percent
Reaction—pH 7.4 to 9.0

72F—Zahill clay loam, 25 to 60 percent slopes

Setting

Landform: Hills
Slope: 25 to 60 percent

Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Zahill and similar soils: 85 percent

Minor Components

Korchea and similar soils: 0 to 1 percent
Vida and similar soils: 0 to 6 percent
Bedrock at 10 to 60 inches: 0 to 4 percent
Soils that have slopes less than 25 percent: 0 to 2 percent
Soils that have slopes more than 60 percent: 0 to 1 percent
Areas of rock outcrop: 0 to 1 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

729F—Zahill-Obrien clay loams, 15 to 60 percent slopes

Setting

Landform: Zahill—hills; Obrien—hills
Position on landform: Zahill—back slopes; Obrien—back slopes
Slope: Zahill—15 to 60 percent; Obrien—15 to 60 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Zahill and similar soils: 45 percent
Obrien and similar soils: 40 percent

Minor Components

Poorly drained soils: 0 to 2 percent
Obrien loam: 0 to 9 percent
Soils that have slopes less than 15 percent: 0 to 3 percent
Soils that have slopes more than 60 percent: 0 to 1 percent

Major Component Description

Zahill

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

Obrien

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.7 inches

725F—Zahill-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform: Zahill—hills; Rock outcrop—hills
Position on landform: Zahill—back slopes; Rock outcrop—shoulders
Slope: 25 to 60 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Zahill and similar soils: 60 percent
Rock outcrop: 25 percent

Minor Components

Korchea and similar soils: 0 to 1 percent
Obrien and similar soils: 0 to 2 percent
Whitlash and similar soils: 0 to 5 percent
Soils with ponderosa pine: 0 to 2 percent
Soils that have slopes more than 60 percent: 0 to 1 percent
Soils that have slopes less than 25 percent: 0 to 4 percent

Major Component Description

Zahill

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

Rock outcrop

Definition: Exposures of igneous and metamorphic bedrock
Flooding: None

899F—Zahill-Rock outcrop-Whitlash complex, 15 to 60 percent slopes

Setting

Landform: Zahill—hills; Rock outcrop—hills; Whitlash—hills
Position on landform: Zahill—foot slopes; Rock outcrop—shoulders; Whitlash—back slopes and shoulders
Slope: Zahill—15 to 60 percent; Whitlash—15 to 60 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Zahill and similar soils: 35 percent
Rock outcrop: 30 percent
Whitlash and similar soils: 20 percent

Minor Components

Obrien and similar soils: 0 to 6 percent
Soils with ponderosa pine: 0 to 4 percent
Soils that have slopes less than 15 percent: 0 to 1 percent
Soils that have slopes more than 60 percent: 0 to 4 percent

Major Component Description

Zahill

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

Rock outcrop

Definition: Exposures of igneous and metamorphic bedrock
Flooding: None

Whitlash

Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 1.7 inches

721E—Zahill-Vida clay loams, 15 to 25 percent slopes

Setting

Landform: Zahill—hills; Vida—hills
Position on landform: Zahill—shoulders; Vida—back slopes
Slope: Zahill—15 to 25 percent; Vida—15 to 25 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Zahill and similar soils: 50 percent
Vida and similar soils: 35 percent

Minor Components

Soils that have bedrock at 20 to 60 inches: 0 to 2 percent
Vida loam: 0 to 5 percent
Zahill gravelly loam: 0 to 4 percent
Soils that have slopes more than 25 percent: 0 to 1 percent
Soils that have slopes less than 15 percent: 0 to 3 percent

Major Component Description

Zahill

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

Vida

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 8.1 inches

722D—Zahill-Vida clay loams, 8 to 15 percent slopes

Setting

Landform: Zahill—hills; Vida—hills
Position on landform: Zahill—shoulders; Vida—back slopes
Slope: Zahill—8 to 15 percent; Vida—8 to 15 percent
Mean annual precipitation: 13 to 17 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Zahill and similar soils: 45 percent
Vida and similar soils: 40 percent

Minor Components

Zahill gravelly loam: 0 to 8 percent
Vida loam: 0 to 5 percent
Soils that have slopes more than 15 percent: 0 to 2 percent

Major Component Description

Zahill

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 9.6 inches

Vida

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: About 8.1 inches

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hill slopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillite. Weakly metamorphosed mudstone or shale.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.75
Low	3.75 to 5.0
Moderate	5.0 to 7.5
High	more than 7.5

Avalanche chute. The track or path formed by an avalanche.

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep or very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, a felled tree generally is reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation by use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Cirque. A semicircular, concave, bowllike area that has steep faces primarily resulting from erosive activity of a mountain glacier.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from the adjacent stands.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent cobbles, and extremely cobbly soil material is more than 60 percent cobbles.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forest land capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse grained, clastic rock composed of rounded to subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion; in areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a “wire” when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very

hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called culmination of mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming with the dip of underlying bedded rock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit the use of a full stripcropping pattern.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly have a layer with low

hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between individual trees. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. A firebreak also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the stream.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothills. A region of relatively low, rounded hills at the base of a mountain range.

Foot slope. The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface profile is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Giant ripple mark. The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. A gullied map unit is one that has numerous gullies.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the number 2 precedes the letter C.

Cr horizon.—Sedimentary beds of consolidated sandstone and semiconsolidated and

consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and are less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lateral moraine. A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low-residue crops. Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Mean annual increment (MAI). The average annual increase in volume of a tree during the entire life of the tree.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Miscellaneous water. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine. An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of limited summit area and generally having steep sides (slopes greater than 25 percent) and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by deep-seated earth movements or volcanic action and secondarily by differential erosion.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata mainly red in color and composed largely of sandstone and shale.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	more than 16

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder slope. The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the county.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Tailwater. The water directly downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive arcuate ridge or complex of ridges underlain by till and other types of drift.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water-spreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

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United States
Department of
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Natural Resources
Conservation
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In cooperation with United
States Department of the
Interior, Bureau of Indian
Affairs and the Montana
Agricultural Experiment
Station

Soil Survey of Hill County, Montana Part II

How to Use This Soil Survey

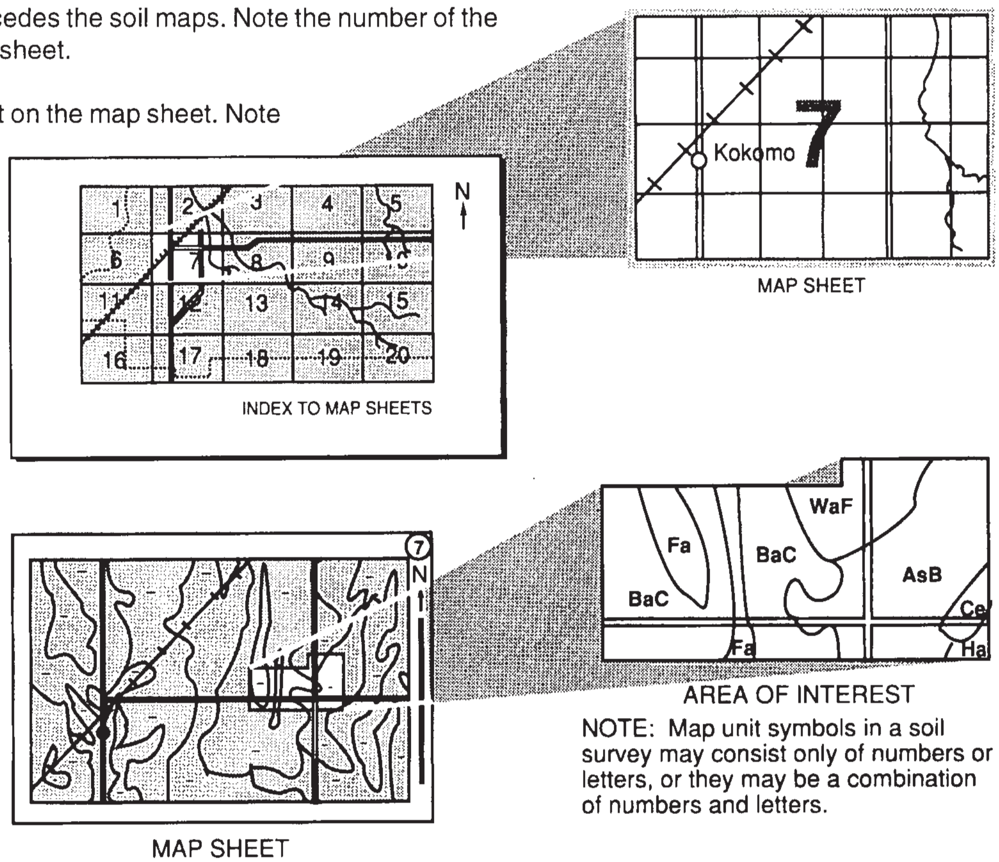
This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the detailed soil map units and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets,** which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.



The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

A **State Soil Geographic Data Base** (STATSGO) is available for this survey area. This data base consists of a soils map at a scale of 1:250,000 along with groups of associated soils. It replaces the general soils map published in older surveys. This map and its data base can be useful for planning multi-county areas and map output can be tailored for specific use. For more information about the State Soil Geographic Data Base for this survey area, or for any portion of Montana, contact your local Natural Resources Conservation Service office.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the Natural Resources Conservation Service; United States Department of the Interior, Bureau of Indian Affairs; and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Hill County Conservation District and the Chippewa-Cree Tribal Council.

Cover: Wheat field in Hill County, Montana. Bear Paw Mountains are in the background.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

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Issued 2003

Detailed Soil Map Unit Legend

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16B—Degrand loam, 0 to 4 percent slopes
22E—Hillon loam, 15 to 25 percent slopes
22F—Hillon loam, 25 to 60 percent slopes
24A—Hanly loamy fine sand, 0 to 2 percent slopes
27B—Attewan loam, 0 to 4 percent slopes
28A—Nishon clay loam, 0 to 1 percent slopes
30A—Marvan clay, 0 to 2 percent slopes
30C—Marvan clay, 2 to 8 percent slopes
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32A—Kobase clay loam, 0 to 2 percent slopes
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334B—Phillips-Kevin complex, 0 to 4 percent slopes
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W—Water

Summary of Tables

Part I (For page numbers, see "Summary of Tables" in Part I)

Part II

Soil Survey of Hill County, Montana

This soil survey is an inventory and evaluation of the soils in the county. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Even though soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the county. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The classification and extent of the soils in this county are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Absher	Fine, montmorillonitic Typic Natriboralfs
Ambrant	Coarse-loamy, mixed, frigid Typic Ustochrepts
Attewan	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Bascovy	Fine, montmorillonitic, frigid Leptic Udic Haplusterts
Bearpaw	Fine, montmorillonitic Typic Argiborolls
Beaverton	Loamy-skeletal over sandy or sandy-skeletal, mixed Typic Argiborolls
Belain	Coarse-loamy, mixed Typic Haploborolls
Benz	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Blacksheep	Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents
Bowery	Fine-loamy, mixed Pachic Haploborolls
Bullhook	Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Busby	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Cabba	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cabbart	Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents
Chinook	Coarse-loamy, mixed Aridic Haploborolls
Cozberg	Coarse-loamy, mixed Aridic Haploborolls
Creed	Fine, montmorillonitic Typic Natriboralfs
Degrand	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Delpoint	Fine-loamy, mixed, frigid Aridic Ustochrepts
Dimmick	Fine, montmorillonitic, frigid Vertic Epiaquolls
Eagleton	Fine-loamy, mixed, frigid Cumulic Endoaquolls
Elkner	Coarse-loamy, mixed Typic Cryochrepts
Elloam	Fine, montmorillonitic Typic Natriboralfs
Enbar	Fine-loamy, mixed Cumulic Haploborolls
Ethridge	Fine, montmorillonitic Aridic Argiborolls
Evanston	Fine-loamy, mixed Aridic Argiborolls
Farnuf	Fine-loamy, mixed Typic Argiborolls
Ferd	Fine, montmorillonitic Glossic Eutroboralfs
Fortbenton	Fine-loamy, mixed Aridic Haploborolls
Garlet	Loamy-skeletal, mixed Typic Cryochrepts
Gerdrum	Fine, montmorillonitic Typic Natriboralfs
Glendive	Coarse-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hanly	Sandy, mixed, frigid Aridic Ustifluvents
Harlake	Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents
Havre	Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hedoes	Coarse-loamy, mixed Pachic Haploborolls
Hillon	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Hingham	Coarse-silty, mixed Aridic Haploborolls
Joplin	Fine-loamy, mixed Aridic Argiborolls
Kenilworth	Fine-loamy, mixed Aridic Argiborolls
Kevin	Fine-loamy, mixed Aridic Argiborolls
Kobase	Fine, montmorillonitic, frigid Aridic Ustochrepts
Korchea	Fine-loamy, mixed (calcareous), frigid Mollic Ustifluvents
Kremlin	Fine-loamy, mixed Aridic Haploborolls
Laceycreek	Fine loamy, mixed Pachic Udic Argiborolls

Classification of the Soils--Continued

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Lonesome	Sandy over loamy, mixed (calcareous), frigid Aridic Ustorthents
Lonna	Fine-silty, mixed, frigid Aridic Ustochrepts
Lostriver	Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents
Macar	Fine-loamy, mixed, frigid Typic Ustochrepts
Marias	Fine, montmorillonitic, frigid Chromic Udic Haplusterts
Marmarth	Fine-loamy, mixed Aridic Argiborolls
Marvan	Fine, montmorillonitic, frigid Sodic Haplusterts
*McKenzie	Fine, montmorillonitic, frigid Chromic Endoaquerts
Neldore	Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents
Nesda	Sandy-skeletal, mixed Fluventic Haploborolls
Nishon	Fine, montmorillonitic, frigid Typic Albaqualfs
Nobe	Fine, montmorillonitic (calcareous), frigid Oxyaquic Ustorthents
Obrien	Fine-loamy, mixed Pachic Haploborolls
Perma	Loamy-skeletal, mixed Typic Haploborolls
Phillips	Fine, montmorillonitic Typic Eutroboralfs
Scobey	Fine, montmorillonitic Aridic Argiborolls
Straw	Fine-loamy, mixed Cumulic Haploborolls
Tally	Coarse-loamy, mixed Typic Haploborolls
Telstad	Fine-loamy, mixed Aridic Argiborolls
Thibadeau	Fine-loamy, mixed (calcareous), frigid Oxyaquic Ustifluvents
Thoeny	Fine, montmorillonitic Typic Natriboralfs
Tinsley	Sandy-skeletal, mixed, frigid Typic Ustorthents
Twilight	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Vida	Fine-loamy, mixed Typic Argiborolls
Waltham	Fine, montmorillonitic Typic Natriboralfs
Warwood	Fine-loamy, mixed Glossic Cryoboralfs
Weingart	Fine, montmorillonitic Typic Natriboralfs
Wheatbelt	Very-Fine, montmorillonitic, frigid Sodic Epiaquerts
Whitlash	Loamy-skeletal, mixed Lithic Haploborolls
Williams	Fine-loamy, mixed Typic Argiborolls
Winkler	Loamy-skeletal, mixed, frigid Typic Ustochrepts
Yamacall	Fine-loamy, mixed, frigid Aridic Ustochrepts
Yawdim	Clayey, montmorillonitic (calcareous), frigid, shallow Aridic Ustorthents
Yetull	Mixed, frigid Typic Ustipsamments
Zahill	Fine-loamy, mixed (calcareous), frigid Typic Ustorthents

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
13A	McKenzie clay, 0 to 1 percent slopes	5,079	0.3
16B	Degrand loam, 0 to 4 percent slopes	2,645	0.1
22E	Hillon loam, 15 to 25 percent slopes	12,492	0.7
22F	Hillon loam, 25 to 60 percent slopes	20,334	1.1
24A	Hanly loamy fine sand, 0 to 2 percent slopes	894	0.1
27B	Attewan loam, 0 to 4 percent slopes	1,385	0.1
28A	Nishon clay loam, 0 to 1 percent slopes	10,082	0.5
30A	Marvan clay, 0 to 2 percent slopes	3,365	0.2
30C	Marvan clay, 2 to 8 percent slopes	836	*
31A	Ferd loam, 0 to 2 percent slopes	2,828	0.2
32A	Kobase clay loam, 0 to 2 percent slopes	5,133	0.3
33A	Phillips loam, 0 to 2 percent slopes	9,928	0.5
34A	Dimmick clay, 0 to 1 percent slopes	4,069	0.2
36A	Chinook fine sandy loam, 0 to 2 percent slopes	10,153	0.5
36C	Chinook fine sandy loam, 2 to 8 percent slopes	4,173	0.2
37A	Evanston loam, 0 to 2 percent slopes	21,330	1.1
51A	Wheatbelt clay, 0 to 1 percent slopes	13,996	0.8
53D	Beaverton gravelly loam, 4 to 15 percent slopes	460	*
55A	Benz clay loam, 0 to 2 percent slopes	1,198	0.1
60A	Havre loam, 0 to 2 percent slopes	8,899	0.5
62C	Weingart complex, 2 to 8 percent slopes	3,110	0.2
72F	Zahill clay loam, 25 to 60 percent slopes	20,197	1.1
74B	Marias silty clay, 0 to 4 percent slopes	3,481	0.2
75B	Farnuf loam, 0 to 4 percent slopes	745	*
75C	Farnuf loam, 4 to 8 percent slopes	742	*
76B	Bowery loam, 0 to 4 percent slopes	609	*
76C	Bowery loam, 4 to 8 percent slopes	1,479	0.1
76D	Bowery loam, 8 to 15 percent slopes	1,282	0.1
78A	Lostriver clay, 0 to 2 percent slopes	4,439	0.2
79B	Yamacall loam, 0 to 4 percent slopes	2,050	0.1
81A	Glendive fine sandy loam, 0 to 2 percent slopes	4,618	0.3
84A	Bullhook clay loam, 0 to 2 percent slopes	4,872	0.3
90A	Harlake clay, 0 to 2 percent slopes	3,208	0.2
92B	Marmarth loam, 0 to 4 percent slopes	1,127	0.1
93D	Tally fine sandy loam, 4 to 15 percent slopes	388	*
96B	Fortbenton fine sandy loam, 0 to 4 percent slopes	24,270	1.3
96C	Fortbenton fine sandy loam, 4 to 8 percent slopes	3,142	0.2
98B	Kremlin loam, 0 to 4 percent slopes	20,185	1.1
99A	Thibadeau clay loam, 0 to 2 percent slopes	4,562	0.2
110D	Laceycreek loam, 8 to 15 percent slopes	1,000	*
115B	Thoeny-Elloam complex, 0 to 4 percent slopes	15,222	0.8
171C	Delpoint-Cabbart loams, 2 to 8 percent slopes	2,030	0.1
172C	Delpoint complex, 2 to 8 percent slopes	3,272	0.2
182F	Garlet-Elkner complex, 25 to 70 percent slopes	6,577	0.4
191F	Winkler-Ambrant complex, 25 to 60 percent slopes	5,104	0.3
200F	Badland	2,326	0.7
203F	Cabba-Rock outcrop complex, 25 to 60 percent slopes	630	*
204F	Cabba-Zahill complex, 25 to 60 percent slopes	2,723	0.2
205F	Cabba-Macar loams, 15 to 60 percent slopes	450	*
211F	Cabbart-Rock outcrop complex, 25 to 60 percent slopes	8,576	0.4
212F	Cabbart-Hillon loams, 25 to 60 percent slopes	9,378	0.5
213E	Cabbart-Yawdim complex, 8 to 25 percent slopes	591	*
221D	Hillon-Kevin clay loams, 8 to 15 percent slopes	5,827	0.3
224D	Hillon-Joplin loams, 8 to 15 percent slopes	22,250	1.2
241A	Hanly loamy fine sand, 0 to 2 percent slopes, occasionally flooded	3,000	0.2
251D	Bascovy-Neldore clays, 2 to 15 percent slopes	3,454	0.2
262A	Absher-Gerdrum complex, 0 to 2 percent slopes	2,121	0.1
272C	Attewan-Tinsley complex, 2 to 8 percent slopes	2,988	0.2
304A	Marvan-Nobe clays, 0 to 2 percent slopes	1,311	0.1
309A	Marvan complex, 0 to 2 percent slopes	5,551	0.3
311B	Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes	15,523	0.8

*See footnote at end of table

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
321A	Kobase clay loam, calcareous, 0 to 2 percent slopes	1,987	0.1
331B	Phillips-Elloam complex, 0 to 4 percent slopes	163,861	8.8
334B	Phillips-Kevin complex, 0 to 4 percent slopes	54,388	2.9
362C	Chinook-Yetull complex, 2 to 10 percent slopes	2,250	0.1
375B	Evanston-Lonna loams, 0 to 4 percent slopes	2,096	0.1
381A	Ethridge clay loam, 0 to 2 percent slopes	11,207	0.6
400F	Rubble land-Rock outcrop complex	546	*
402A	Gerdrum-Absher-Creed complex, 0 to 2 percent slopes	6,223	0.3
421C	Joplin-Hillon loams, 2 to 8 percent slopes	133,630	7.2
441C	Kevin-Hillon clay loams, 2 to 8 percent slopes	59,643	3.2
442C	Kevin-Elloam clay loams, 2 to 8 percent slopes	15,180	0.8
501B	Telstad-Hillon loams, 0 to 4 percent slopes	31,407	1.7
503B	Telstad-Joplin loams, 0 to 4 percent slopes	402,831	21.6
503C	Telstad-Joplin loams, 4 to 8 percent slopes	8,706	0.5
522A	Elloam-Absher complex, 0 to 2 percent slopes	2,738	0.2
530F	Warwood loam, 15 to 45 percent slopes	4,086	0.2
561B	Scobey-Kevin clay loams, 0 to 4 percent slopes	236,837	12.7
561C	Scobey-Kevin clay loams, 4 to 8 percent slopes	6,356	0.3
564B	Scobey-Hillon clay loams, 0 to 4 percent slopes	6,986	0.4
571D	Chinook-Cozberg-Yetull fine sandy loams, 4 to 15 percent slopes	4,379	0.2
573B	Cozberg-Chinook fine sandy loams, 0 to 4 percent slopes	4,778	0.3
603A	Havre-Harlake clay loams, 0 to 2 percent slopes	15,035	0.8
604A	Havre-Glendive complex, 0 to 2 percent slopes	6,030	0.3
611B	Hingham-Lonna loams, 0 to 4 percent slopes	6,981	0.4
661C	Twilight-Blacksheep fine sandy loams, 2 to 8 percent slopes	2,894	0.2
671B	Bearpaw-Vida clay loams, 0 to 4 percent slopes	20,006	1.1
671C	Bearpaw-Vida clay loams, 4 to 8 percent slopes	17,866	1.0
671D	Bearpaw-Vida clay loams, 8 to 15 percent slopes	5,214	0.3
674B	Bearpaw-Waltham clay loams, 0 to 4 percent slopes	953	0.1
696C	Vida-Zahill-Bearpaw clay loams, 2 to 8 percent slopes	9,143	0.5
701D	Yetull-Busby fine sandy loams, 4 to 15 percent slopes	1,964	0.1
721E	Zahill-Vida clay loams, 15 to 25 percent slopes	10,758	0.6
722D	Zahill-Vida clay loams, 8 to 15 percent slopes	4,925	0.3
725F	Zahill-Rock outcrop complex, 25 to 60 percent slopes	5,414	0.3
729F	Zahill-Obrien clay loams, 15 to 60 percent slopes	16,669	0.9
732C	Yetull-Lonesome loamy fine sands, 0 to 8 percent slopes	3,201	0.2
761D	Hedoes-Belain loams, 4 to 15 percent slopes	331	*
761F	Hedoes-Belain loams, 15 to 35 percent slopes	2,208	0.1
763E	Laceycreek loam, moist, 8 to 25 percent slopes	10,281	0.6
791C	Yamacall-Hillon loams, 2 to 8 percent slopes	1,738	0.1
795C	Yamacall-Benz clay loams, 2 to 8 percent slopes	4,671	0.3
799C	Yamacall clay loam, 2 to 8 percent slopes	2,413	0.1
801B	Williams-Vida loams, 0 to 4 percent slopes	1,220	*
801C	Williams-Vida loams, 4 to 8 percent slopes	3,176	0.2
812A	Glendive fine sandy loam, calcareous, 0 to 2 percent slopes	895	0.1
831A	Straw-Korchea loams, 0 to 2 percent slopes	1,525	0.1
832A	Nesda complex, 0 to 2 percent slopes	343	*
833A	Enbar-Straw-Eagleton loams, 0 to 2 percent slopes	4,812	0.3
842A	Bullhook-Nobe complex, 0 to 2 percent slopes	1,887	0.1
883F	Perma-Whitlash complex, 25 to 70 percent slopes	26,345	1.4
892F	Whitlash-Belain-Rock outcrop complex, 25 to 60 percent slopes	1,115	0.1
895F	Whitlash-Perma-Rock outcrop complex, 25 to 70 percent slopes	3,198	0.2
896F	Perma-Whitlash, cool-Rock outcrop complex, 25 to 70 percent slopes	13,327	0.7
899F	Zahill-Rock outcrop-Whitlash complex, 15 to 60 percent slopes	10,409	0.6
911F	Belain-Whitlash, moist-Hedoes complex, 15 to 60 percent slopes	8,808	0.5
915F	Belain-Whitlash-Hedoes complex, 15 to 45 percent slopes	9,635	0.5
951B	Kenilworth-Fortbenton fine sandy loams, 0 to 4 percent slopes	16,535	0.9
962B	Fortbenton loam, 0 to 4 percent slopes	29,324	1.6
965B	Fortbenton-Chinook fine sandy loams, 0 to 6 percent slopes	13,159	0.7
968C	Fortbenton-Hillon complex, 2 to 8 percent slopes	14,985	0.8
968D	Hillon-Fortbenton complex, 8 to 25 percent slopes	2,229	0.1

*See footnote at end of table

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
971F	Neldore-Bascovy silty clays, 25 to 60 percent slopes	2,412	0.1
974F	Neldore-Hillon complex, 25 to 70 percent slopes	4,340	0.2
DA	Denied access	3,840	0.2
M-W	Miscellaneous water	20	*
W	Water	10,562	0.6
	Total	1,866,600	100.0

* Less than 0.1 percent. The combined extent of the soils assigned an asterisk in the "Percent" column is about 1.1 percent of the county.

Agronomy

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider obtaining specific information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Cropland in Hill County

About 65 percent of the county is cropland, consisting of approximately 1,201,397 acres of dryland farming and 2,000 acres of irrigated cropland.

The two main dryland crops are wheat and barley. In most years spring wheat and winter wheat are planted in nearly equal amounts, thus making wheat the dominant crop. Other crops include malting barley, alfalfa hay, grass for hay and pasture, grass for seed, durum wheat, triticale, oats, safflower, sunflowers, canary seed, corn for silage, and potatoes.

The main considerations in managing nonirrigated cropland are conserving moisture, reducing water erosion and soil blowing, and controlling soil salinity. Each is explained in the following paragraphs.

Conserving soil moisture

Most of the county does not receive enough annual precipitation to produce a profitable crop every year. A small grain-fallow rotation is commonly used to ensure a successful crop. In this rotation, soil moisture accumulated during the fallow period is critical to the yield of the next crop. Each additional inch of stored soil moisture helps produce an estimated 4 to 5 bushels of wheat or 5 to 7 bushels of barley.

When using a small grain-fallow system, some soils are not capable of storing all the moisture received from snow and rainfall before the next crop. Sandy soils and very shallow soils are in this category. Water is lost by deep percolation below the crop root zone, or lost by runoff where the infiltration rate of precipitation is too slow. These soils are sometimes cropped every year since accumulated moisture from summer fallow is not available to the crop.

Management practices to help conserve moisture include good weed control, leaving stubble stand over the first winter after harvest, reducing tillage operations, leaving 30 percent or more of the residue on the surface during the fallow year, and planting moisture-efficient crop varieties. Barley is generally more efficient than spring wheat. Semidwarf varieties of spring wheat generally are more efficient than tall varieties, in terms of their ability to convert soil moisture into bushels of grain.

In areas where enough soil moisture is accumulated after harvest and over the winter, recropping may be more profitable than the traditional crop-fallow system. Though the science is not exact, 2 feet of moist soil, by probing in medium to heavy textured soils, is considered enough to produce an adequate crop in most years. This is equal to stored soil moisture of between 3.5 and 4.5 inches. With this formula, growing season precipitation is expected to be normal or near normal for a successful crop. Additional fertilizer is needed to recrop because nutrients which are normally released from the crop residue breakdown of a crop-fallow system, are still contained in the residue.

Reducing soil blowing

Soil blowing is a problem on most cultivated soils in a crop-fallow rotation. Most soil blowing takes place after the fallow season of November through May. It is a special problem early in the spring when persistent strong winds exist. Unless well managed, sands and clays are readily eroded during this period. Loamy soils can also erode if cultivated in wide strips or blocks during dry periods when the wind velocity is high.

Loss of the surface layer through erosion affects soil productivity, soil tilth, available water holding capacity, rooting depth, and the sediment load in streams. In addition, it often affects crop yield

indirectly by removing or displacing chemical fertilizers and pesticides, and it contributes to the chemical pollution of surface waters.

Management practices to help reduce soil blowing include grasses and legumes in the rotation; alternating strips of cropland fallow; recropping when feasible; maintaining crop residues on the soil surface with mulch or reduced tillage; using low-crown shovels and sweeps; reducing tillage speeds; maintaining a cloddy or ridged surface; and planting wind barriers such as trees or tall wheatgrass rows.

The primary prevention method is to combine the proper width of wind strips with the maintenance of adequate crop residues on the soil surface. The amount of crop residue needed for good protection varies with the soil, topography, size of the field, and climate. There are enough differences in precipitation and wind velocity within the county to cause significantly different erosion hazards from area to area. For specific information on climatic factors and erosion hazards, contact the local office of the Natural Resources Conservation Service.

Reducing water erosion

Runoff causes erosion on most cropland with slopes of 2 percent or more; however, the majority of water erosion takes place on cropland with slopes of 6 percent or more. Factors that contribute to water erosion, but which can be altered by the operator, are degree of slope, slope length, and crop and residue management.

If degree of slope is an erosion factor, a diversion ditch can be used. It can divert runoff water from uphill areas, carrying it away from the cropland to grassed or rocky areas, or to grassed waterways in the field. This will help to prevent gullying. Diversion ditches are not common in the county due to the expense of construction and the maintenance required; however, grassed waterways are an excellent method to carry runoff water through a cropped field and avoid gullying. Farm equipment must be raised when crossing the waterway, but the only maintenance required is mowing or harvesting the grass in order to prevent deep snowpacks from forming in the waterway. Rapid melting of deep snowpacks can cause gullying even within a grassed waterway.

Practices commonly used to reduce water erosion are related to crop and residue management. On livestock farms, good hay and pasture crops in rotation with small grains help to reduce soil loss to an acceptable level. Practices used on grain farms include cross-slope farming, field stripcropping with grass buffer strips, contour stripcropping, and maintaining crop residue on the soil surface. Leaving crop residue on the surface helps to reduce erosion by protecting the soil from raindrop splash, and by reducing the overland transport of soil. Crop residue also increases the water infiltration of a soil before it begins to run off.

Controlling saline seep

Saline seep results when soil water moves below the root zone and collects on top of the impermeable underlying shale or bedrock. The problem of excess water occurs mainly in areas of crop-fallow dryland farming. During fallow periods, more water is stored in the soil than can be used by the crop. The excess water then percolates below the root zone of the crop and dissolves salts in the soil or parent material below. When it reaches an impermeable layer below, it begins to move laterally and downslope, dissolving more salts and resurfacing to form saline seeps. Soils with saline seep commonly are too wet to farm across, and time consuming to farm around. Those that can be farmed generally are nonproductive. Once formed, saline seeps may increase in size at the rate of 5 to 10 percent per year.

For nonirrigated cropland the most effective solution for the saline seep problem is using water where it falls. This can be done by recropping, or by establishing deep rooted grasses and legumes in the recharge area (the area where excess water accumulation occurs). The recharge area is usually at least ten times the size of the existing seep.

Early detection of potential saline seep areas is necessary to correct the problem area. New or developed wet spots, areas of late-maturing crops, or the prolific growth of foxtail barley or kochia all indicate areas that should be examined for salinity by soil probing and soil sampling. Identified seep areas may be complex, with more than one recharge area involved. These should be investigated with a drill rig, which is accomplished by placing several shallow wells in the suspected recharge areas to determine the direction of water flow into the seep area. More specific information can be obtained by contacting the local Natural Resources Conservation Service office.

Irrigation

Approximately 2,000 acres of cropland are irrigated in the county. Irrigated land is primarily used for feed barley, spring wheat, hayland and pasture, and a

limited amount of corn production. The most common needs in irrigated soil management are practices for efficient water use, erosion control, productivity maintenance, and soil tilth.

Water supplies along the Marias and Milk rivers and along the Beaver, Sage, Big Sandy, Lodge, and Box Elder Creeks generally are good. Sage, Big Sandy and Lodge Creeks, however, often dry up in mid-summer. Irrigated areas on benches, along the Marias and Milk Rivers, are under sprinkler systems. The valley bottoms are surface irrigated, using graded borders or sprinkler systems. Irrigation along the creeks consists mostly of sprinklers, with some graded borders. Flows diverted from Beaver Creek primarily are used for flood irrigation. Water loss and the distribution patterns from high winds lower the irrigation efficiency of high pressure sprinkler systems. Operations on benches above the rivers have higher pumping costs due to the extra horse power needed to lift water from the river valley.

The method of applying water to soil must be compatible with soil intake rates, soil slopes, vegetation cover, volume of water available, and reasonable set times for irrigation. Successful management depends upon knowledge of when to irrigate, optimum set times, and the application rates. A general rule of thumb is that small grains and forage crops should be irrigated when half of the available soil moisture has been used. Determining when half of the soil moisture is used depends on growing conditions and plant growth stage. Set times and application rates should be designed and managed to apply water with the greatest efficiency possible.

The objective of irrigation water management is to apply water to meet the crops needs, and yet avoid excessive water loss through deep percolation and/or runoff. Deep percolation is not only a water loss and plant nutrient leaching problem, but excess water in the profile can cause saline seeps to appear downslope. Excess runoff can cause rill and gully erosion. Excessive water volumes in return flow channels can cause erosion and water quality problems downstream. Erosion is caused by runoff from irrigating too frequently, continuing to apply water after the profile is saturated, or applying water volumes that are too large. These runoff and erosion problems are greater as the slope increases. Poorly designed sprinkler systems, especially on low intake soils, can cause ponding and erosion from runoff. Contour ditch irrigation can be a suitable practice, but erosion can be a hazard on slopes exceeding 4 percent. Close contour ditch spacings and permanent vegetation cover on slopes greater than 4 percent will reduce erosion potential. If the proper volume of water and the set time meet the surface system design, runoff and erosion are minimized. Some practices with the potential to increase irrigation efficiency are irrigation scheduling, low pressure sprinkler systems, low profile center pivots, irrigation land leveling, well-designed contour ditch systems, gated pipe, and lined water conveyance systems.

Continuous small grain production and the removal of crop residue through bailing or burning can cause a deficiency of nitrogen and phosphorus. Nitrogen is also lost by leaching from the irrigation water, and phosphorus can be carried off the field in runoff. Fertilization is necessary for high crop yields on irrigated soils. Including legumes in the cropping system will help soil tilth and correct part of the nitrogen deficiency. Mineral fertilizers can be applied according to soil tests that provide required nitrogen and phosphorus levels. When feasible, all crop residue should be returned to the soil. Residue will return some nutrients to the soil, increase organic matter, improve soil structure, and increase the water intake of most soils.

Waterspreading

There are approximately 10,000 acres which use waterspreading in Hill County. These acres primarily are along water courses or small streams. Waterspreading systems are suited to locations where the topography and climatic conditions are such that additional moisture can be expected to improve plant growth. Waterspreading differs from irrigation in that applications are timed by the availability of natural runoff flow, rather than scheduled to meet plant needs. Waterspreading systems typically are used for pasture and hayland and for some small grain production.

Cropland Limitations and Hazards

The management concerns affecting the use of the detailed map units in the county for crops are shown in the table "Main Cropland Limitations and Hazards." The main concerns in managing nonirrigated cropland are conserving moisture, controlling soil blowing and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water intake rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

A combination of several practices generally is needed to control *soil blowing* and *water erosion.*

Conservation tillage, stripcropping, field windbreaks, tall grass barriers, contour farming, conservation cropping systems, crop residue management, diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining *soil fertility* include applying fertilizer, both organic and inorganic and including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the limitations and hazards shown in the table cannot be easily overcome. These are *channels, flooding, depth to rock, ponding, gullies,* and *lack of timely precipitation.*

Additional limitations and hazards are as follows:

Areas of rock outcrop and slick spots.—Farming around these areas may be feasible. Subsoiling or deep ripping soft sedimentary beds increases the effective rooting depth and the rate of water infiltration.

Excessive permeability.—This limitation causes deep leaching of nutrients and pesticides. The capacity of the soil to retain moisture for plant use is poor.

Potential for ground-water pollution.—This is a hazard in soils with excessive permeability, hard bedrock, or a water table within the profile.

Lime content, limited available water capacity, poor tilth, restricted permeability, and *surface crusting.*—These limitations can be overcome by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. Also, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Short frost-free period.—If the growing season is less than 90 days, short-season crops or grasses should be grown.

Surface rock fragments.—This limitation causes rapid wear of tillage equipment. It cannot be easily overcome.

Slope.—Where the slope is more than 8 percent, water erosion and soil blowing may be accelerated unless conservation farming practices are applied.

Surface stones.—Stones or boulders on the surface can hinder normal tillage unless they are removed.

Salt and sodium content.—In areas where this is a limitation, only salt- and sodium-tolerant crops should be grown.

On irrigated soils the main management concerns are *efficient water use, nutrient management, control of erosion, pest and weed control,* and *timely planting and harvesting* for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, and causes erosion. It can also create drainage problems, raise the water table, and increase soil salinity.

Following is an explanation of the criteria used to determine the limitations or hazards:

Areas of rock outcrop.—Rock outcrop is a named component of the map unit.

Areas of rubble land.—Rubble land is a named component of the map unit.

Areas of slick spots.—Slick spots are a named component of the map unit.

Channeled.—The word "channeled" is included in the name of the map unit.

Depth to rock.—Bedrock is within a depth of 40 inches.

Excessive permeability.—The upper limit of the permeability range is 6 inches or more within the soil profile.

Flooding.—The component of the map unit is occasionally flooded or frequently flooded.

Gullied.—The word "gullied" is included in the name of the map unit.

Lack of timely precipitation.—The component of the map unit has a Xeric moisture regime. The amount of annual precipitation is no more than 14 inches.

Lime content.—The component is assigned to wind erodibility group 4L or has more than 5 percent lime in the upper 10 inches.

Limited available water capacity.—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 5 inches or less.

Ponding.—Ponding duration is assigned to the component of the map unit.

Potential for ground-water pollution.—The soil has a water table within a depth of 4 feet or hard bedrock within the profile, or permeability is more than 6 inches per hour within the soil.

Poor tilth.—The component of the map unit has more than 35 percent clay in the surface layer.

Restricted permeability.—Permeability is 0.06 inch per hour or less within the soil profile.

Salt content.—The component of the map unit has an electrical conductivity of more than 4 in the surface layer or more than 8 within a depth of 30 inches.

Short frost-free period.—The map unit has a growing season of less than 90 frost-free days.

Slope.—The upper slope range of the component of the map unit is more than 8 percent.

Sodium content.—The sodium adsorption ratio of the component of the map unit is more than 13 within a depth of 30 inches.

Soil blowing.—The wind erodibility index multiplied by the selected high C factor for the county and then divided by the T factor is more than 8 for the Component of the map unit.

Surface rock fragments.—The terms describing the texture of the surface layer include any rock fragment modifier except for gravelly or channery, and "surface stones" is not already indicated as a limitation.

Surface crusting.—The sodium adsorption ratio in the surface layer is 5 or more for any texture and 4 or more if the texture is silt, silt loam, loam, or very fine sandy loam.

Surface stones.—The terms describing the texture of the surface layer include any stony or bouldery modifier, or the soil is a stony or bouldery phase.

Water erosion.—The surface K factor multiplied by the upper slope limit is more than 2 (same as prime farmland criteria).

Water table.—The component of the map unit has a water table within a depth of 60 inches.

Crop Yield Estimates

The average yields per acre that can be expected of the principal crops under a high level of Management are shown in the table "Land Capability and Yields per Acre of Crops." In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the type of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss. Yields for dryland crops are based on a crop-fallow system.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the table are grown in the county, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Pasture and Hayland Interpretations

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

Yield estimates are often provided in animal unit months (AUM), or the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about forage yields other than those shown in the table "Land Capability and Yields per Acre of Crops."

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, as described in "Land Capability Classification" (U.S. Dep. Agric., 1961), soils generally are grouped at three levels: capability class, subclass, and unit. These categories indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grain, cotton, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numerals 1 through 8. The numerals indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and woodland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 4. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 generally are not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class 5 to class 7. The local office of the Cooperative Extension Service or the Natural Resources Conservation Service can provide guidance on the use of these soils as cropland.

Areas in class 8 generally are not suitable for crops, pasture, or woodland without a level of management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses identify the dominant kind of limitation in the class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use mainly to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the table "Land Capability and Yields per Acre of Crops" at the end of this section.

Prime Farmland and Other Important Farmland

In this section, prime farmland and other important farmland are defined. The soils in the county that are considered prime farmland are listed in the table "Prime Farmland" at the end of this section.

Prime Farmland

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and Federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, seed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They either are used for food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and State parks.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and

growing season are favorable, and the level of acidity or alkalinity and the content of salts and sodium are acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods, and they are not frequently flooded during the growing season or are protected from flooding. Slope ranges mainly from 0 to 6 percent.

Soils that have a high water table, are subject to flooding, or are droughty may qualify as prime farmland where these limitations are overcome by drainage measures, flood control, or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information about the criteria for prime farmland can be obtained at the local office of the Natural Resources Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

The map units in the county that meet the requirements for prime farmland are listed in the table "Prime Farmland." On some soils included in the table, measures that overcome limitations are needed. The need for these measures is indicated in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described in the section "Soil Series and Detailed Map Units." This list does not constitute a recommendation for a particular land use.

Unique Farmland

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil qualities, location, growing season, and moisture supply needed for the economic production of sustained high yields of a specific high-quality crop when treated and managed by acceptable farming methods. Examples of such crops are citrus, tree nuts, olives, cranberries, and vegetables.

Lists of unique farmland are developed as needed in cooperation with conservation districts and others.

Additional Farmland of Statewide Importance

Some areas other than areas of prime and unique farmland are of statewide importance in the production of food, feed, fiber, forage, and oilseed crops. The criteria used in defining and delineating these areas are determined by the appropriate state agency or agencies. Generally, additional farmland of statewide importance includes areas that nearly meet the criteria for prime farmland and that economically produce high yields of crops when treated and managed by acceptable farming methods. Some areas can produce as high a yield as areas of prime farmland if conditions are favorable. In some states additional farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

A list of these lands has not been maintained for Montana and thus is not presently available.

Additional Farmland of Local Importance

This land consists of areas that are of local importance in the production of food, feed, fiber, forage, and oilseed crops and are not identified as having national or statewide importance. Where appropriate, this land is identified by local agencies. It may include tracts of land that have been designated for agriculture by local ordinance.

Lists of this land are developed as needed in cooperation with conservation districts and others.

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices.

Soil Erodibility (K) Factor

The soil erodibility factor (K) indicates the susceptibility of a soil to sheet and rill water erosion. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand, the content of sand coarser than very fine sand, the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (Kf) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. It shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance factor (T) is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gullying, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index factor (I) is determined. This factor is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter.

Additional information about wind erodibility groups and K, Kf, T, and I factors can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Windbreaks are often planted on land that did not originally support trees. Knowledge of how trees perform on such land can be gained only by observing and recording the performance of trees that have been planted and have survived. Many popular windbreak species are not indigenous to the areas in which they are planted.

Each tree or shrub species has certain climatic and physiographic limits. Within these parameters, a tree or shrub may grow well or grow poorly, depending on the characteristics of the soil. Each tree or shrub has definable potential heights in a given physiographic area and under a given climate. Accurate definitions of potential heights are necessary when a windbreak is planned and designed.

The table "Windbreaks and Environmental Plantings" shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in this table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a nursery.

Windbreak Suitability Groups

Windbreak suitability groups consist of soils in which the kinds and degrees of the hazards and limitations that affect the survival and growth of trees and shrubs in windbreaks are about the same.

Group 1 consists of soils that have no soil-related hazards or limitations or only slight hazards or limitations if they are used for windbreaks. Slopes are less than 15 percent.

Group 2M consists of soils that have a moderate available water capacity (5 to 10 inches) because of texture, depth, or both. The soils are well drained and are not affected by salinity. A layer of concentrated lime, if it occurs, is below a depth of 24 inches. Slopes are less than 15 percent.

Group 2L consists of soils that have a layer of concentrated lime (more than 15 percent calcium carbonate equivalent) at a depth of about 15 to 24 inches. The available water capacity is at least 5 inches. The soils are well drained and are not affected by salinity or alkalinity (the electrical conductivity is less than 4 millimhos per centimeter). Slopes are less than 15 percent.

Group 2W consists of soils that have an available water capacity of 5 inches or more. If the soils have a

layer of concentrated lime, the layer is below a depth of 15 inches. The depth to a permanent water table is 30 to 60 inches. The soils are not affected by salinity. Slopes are less than 15 percent.

Group 2S consists of soils that are moderately affected by salinity (the electrical conductivity is 4 to 12 millimhos per centimeter). The available water capacity is at least 5 inches. A layer of concentrated lime, if it occurs, is at a depth of 15 inches or more. The water table is at a depth of 30 inches or more. Slopes are less than 15 percent.

Group 3M consists of soils that have an available water capacity of 2 to 5 inches because of texture, depth, or both. A layer of concentrated lime, if it occurs, is at a depth of 15 inches or more. The soils are well drained and are not affected by salinity (the electrical conductivity is less than 4 millimhos per centimeter).

Group 3L consists of soils that have a layer of concentrated lime (more than 15 percent calcium carbonate equivalent) at a depth of less than 15 inches. A permanent water table is at a depth of more than 30 inches. The available water capacity is more than 5 inches. The soils are not affected by salinity (the electrical conductivity is less than 4 millimhos per centimeter). Slopes are less than 15 percent.

Group 3W consists of soils that have an available water capacity of 2 inches or more. If the soils have a layer of concentrated lime, the layer is below a depth of 15 inches. The depth to a permanent water table is 30 inches or less. It is more than 10 inches during all or most of the growing season. The soils are not affected by salinity. Slopes are less than 15 percent.

Group 3S consists of soils that are severely affected by salinity or alkalinity (the electrical conductivity is 12 to 16 millimhos per centimeter). The available water capacity is 5 inches or more. A layer of concentrated lime, if it occurs, is at a depth of more than 15 inches. A permanent water table is at a depth of 30 inches or more. Slopes are less than 15 percent.

Group 4 consists of soils that have slopes of more than 15 percent, except for those in areas where the length of the slopes is 100 feet or less, and the less sloping soils that have very severe limitations, including soils that have a very low available water capacity (2 inches or less); very shallow, stony, or gravelly soils; strongly saline and alkali soils, in which the electrical conductivity is more than 16 millimhos per centimeter; and soils that have a pH of more than 9.0. Rock outcrop also is in this group.

Main Cropland Limitations and Hazards

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
13A:	
McKenzie	Limited available water capacity
	Ponding
	Poor tilth
	Potential for ground-water pollution
	Restricted permeability
	Salt content
	Soil blowing
16B:	
Degrand	Excessive permeability
	Potential for ground-water pollution
	Soil blowing
22E:	
Hillon	Water erosion
	Lime content
	Slope
	Soil blowing
22F:	
Hillon	Water erosion
	Lime content
	Slope
	Soil blowing
24A:	
Hanly	Excessive permeability
	Potential for ground-water pollution
	Soil blowing
27B:	
Attewan	Excessive permeability
	Limited available water capacity
	Potential for ground-water pollution
	Soil blowing
28A:	
Nishon	Ponding
	Potential for ground-water pollution
	Soil blowing
30A:	
Marvan	Lime content
	Poor tilth
	Restricted permeability
	Salt content
	Soil blowing
30C:	
Marvan	Water erosion
	Lime content
	Poor tilth
	Restricted permeability
	Salt content
	Soil blowing
31A:	
Ferd	Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
32A:	
Kobase	Lime content
	Poor tilth
	Soil blowing
	Surface crusting
33A:	
Phillips	Soil blowing
34A:	
Dimmick	Ponding
	Poor tilth
	Potential for ground-water pollution
	Restricted permeability
	Soil blowing
36A:	
Chinook	Soil blowing
36C:	
Chinook	Soil blowing
37A:	
Evanston	Soil blowing
51A:	
Wheatbelt	Ponding
	Poor tilth
	Potential for ground-water pollution
	Restricted permeability
	Salt content
	Sodium content
	Soil blowing
	Surface crusting
53D:	
Beaverton	Water erosion
	Excessive permeability
	Limited available water capacity
	Potential for ground-water pollution
	Slope
	Soil blowing
55A:	
Benz	Lime content
	Salt content
	Sodium content
	Soil blowing
	Surface crusting
60A:	
Havre	Soil blowing
62C:	
Weingart	Depth to rock
	Water erosion
	Lime content
	Limited available water capacity
	Poor tilth
	Restricted permeability

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
62C: (cont.)	
Weingart (cont.)	Salt content
	Sodium content
	Soil blowing
	Surface crusting
Weingart, thin surface	Depth to rock
	Water erosion
	Lime content
	Limited available water capacity
	Poor tilth
	Restricted permeability
	Salt content
	Sodium content
	Soil blowing
	Surface crusting
72F:	
Zahill	Water erosion
	Lime content
	Slope
	Soil blowing
74B:	
Marias	Lime content
	Poor tilth
	Restricted permeability
	Soil blowing
75B:	
Farnuf	Soil blowing
75C:	
Farnuf	Water erosion
	Soil blowing
76B:	
Bowery	Short frost-free period
	Soil blowing
76C:	
Bowery	Water erosion
	Short frost-free period
	Soil blowing
76D:	
Bowery	Water erosion
	Short frost-free period
	Slope
	Soil blowing
78A:	
Lostriver	Lime content
	Poor tilth
	Salt content
	Sodium content
	Soil blowing
	Surface crusting

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
79B:	
Yamacall	Lime content Soil blowing
81A:	
Glendive	Lime content Soil blowing
84A:	
Bullhook	Lime content Poor tilth Salt content Sodium content Soil blowing Surface crusting
90A:	
Harlake	Lime content Poor tilth Soil blowing
92B:	
Marmarth	Depth to rock Limited available water capacity Soil blowing
93D:	
Tally	Water erosion Slope Soil blowing
96B:	
Fortbenton	Soil blowing
96C:	
Fortbenton	Water erosion Soil blowing
98B:	
Kremlin	Soil blowing
99A:	
Thibadeau	Flooding Lime content Poor tilth Potential for ground-water pollution Salt content Sodium content Soil blowing Surface crusting Water table
110D:	
Laceycreek	Water erosion Short frost-free period Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
115B:	
Thoeny	Restricted permeability Salt content Sodium content Soil blowing
Elloam	Restricted permeability Salt content Sodium content Soil blowing
171C:	
Delpoint	Depth to rock Water erosion Lime content Soil blowing
Cabbart	Depth to rock Water erosion Lime content Limited available water capacity Soil blowing
172C:	
Delpoint, calcareous	Depth to rock Water erosion Lime content Soil blowing
Delpoint	Depth to rock Water erosion Lime content Soil blowing
182F:	
Garlet	Water erosion Limited available water capacity Short frost-free period Slope Soil blowing Surface rock fragments
Elkner	Water erosion Excessive permeability Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing
191F:	
Winkler	Water erosion Limited available water capacity Short frost-free period Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
191F: (cont.)	
Ambrant	Water erosion Excessive permeability Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing
Winkler, dry	Water erosion Limited available water capacity Short frost-free period Slope Soil blowing
200F:	
Badland	Nonsoil material
203F:	
Cabba	Areas of rock outcrop Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
Rock outcrop	Nonsoil material
204F:	
Cabba	Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
Zahill	Water erosion Lime content Slope Soil blowing
205F:	
Cabba	Depth to rock Water erosion Lime content Limited available water capacity Short frost-free period Slope Soil blowing
Macar	Water erosion Short frost-free period Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
211F:	
Cabbart	Areas of rock outcrop Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
Rock outcrop	Nonsoil material
212F:	
Cabbart	Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
Hillon	Water erosion Lime content Slope Soil blowing
213E:	
Cabbart	Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
Yawdim	Depth to rock Water erosion Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
221D:	
Hillon	Water erosion Lime content Slope Soil blowing
Kevin	Water erosion Lime content Slope Soil blowing
224D:	
Hillon	Water erosion Lime content Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
224D: (cont.)	
Joplin	Water erosion Lime content Slope Soil blowing
241A:	
Hanly	Excessive permeability Flooding Potential for ground-water pollution Soil blowing
251D:	
Bascovy	Depth to rock Water erosion Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
Neldore	Depth to rock Water erosion Limited available water capacity Poor tilth Slope Soil blowing
262A:	
Absher	Lime content Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
Gerdrum	Poor tilth Restricted permeability Salt content Sodium content Soil blowing
272C:	
Attewan	Water erosion Excessive permeability Limited available water capacity Potential for ground-water pollution Soil blowing
Tinsley	Excessive permeability Limited available water capacity Potential for ground-water pollution Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
304A:	
Marvan	Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
Nobe	Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
309A:	
Marvan, saline	Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
Marvan	Lime content Poor tilth Restricted permeability Soil blowing
311B:	
Ferd	Soil blowing
Creed	Salt content Sodium content Soil blowing
Gerdrum	Poor tilth Restricted permeability Salt content Sodium content Soil blowing
321A:	
Kobase	Lime content Poor tilth Soil blowing Surface crusting
331B:	
Phillips	Soil blowing
Elloam	Restricted permeability Salt content Sodium content Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
334B:	
Phillips	Soil blowing
Kevin	Lime content Soil blowing
362C:	
Chinook	Slope Soil blowing
Yetull	Excessive permeability Limited available water capacity Potential for ground-water pollution Slope Soil blowing
375B:	
Evanston	Soil blowing
Lonna	Lime content Soil blowing
381A:	
Ethridge	Soil blowing
400F:	
Rubble land	Nonsoil material
Rock outcrop	Nonsoil material
402A:	
Gerdrum	Poor tilth Restricted permeability Salt content Sodium content Soil blowing
Absher	Lime content Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
Creed	Salt content Sodium content Soil blowing
421C:	
Joplin	Water erosion Lime content Soil blowing
Hillon	Water erosion Lime content Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
441C:	
Kevin	Water erosion Lime content Soil blowing
Hillon	Water erosion Lime content Soil blowing
442C:	
Kevin	Water erosion Lime content Soil blowing
Elloam	Water erosion Restricted permeability Salt content Sodium content Soil blowing
501B:	
Telstad	Soil blowing
Hillon	Lime content Soil blowing
503B:	
Telstad	Soil blowing
Joplin	Lime content Soil blowing
503C:	
Telstad	Water erosion Soil blowing
Joplin	Water erosion Lime content Soil blowing
522A:	
Elloam	Restricted permeability Salt content Sodium content Soil blowing
Absher	Lime content Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
530F:	
Warwood	Water erosion Short frost-free period Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
561B:	
Scobey	Soil blowing
Kevin	Lime content Soil blowing
561C:	
Scobey	Water erosion Soil blowing
Kevin	Water erosion Lime content Soil blowing
564B:	
Scobey	Soil blowing
Hillon	Lime content Soil blowing
571D:	
Chinook	Water erosion Slope Soil blowing
Cozberg	Water erosion Excessive permeability Limited available water capacity Potential for ground-water pollution Slope Soil blowing
Yetull	Water erosion Excessive permeability Limited available water capacity Potential for ground-water pollution Slope Soil blowing
573B:	
Cozberg	Excessive permeability Limited available water capacity Potential for ground-water pollution Soil blowing
Chinook	Soil blowing
603A:	
Havre	Lime content Poor tilth Soil blowing
Harlake	Lime content Poor tilth Soil blowing
604A:	
Havre	Flooding Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
604A: (cont.)	
Glendive	Flooding Lime content Soil blowing
611B:	
Hingham	Soil blowing
Lonna	Lime content Soil blowing
661C:	
Twilight	Depth to rock Limited available water capacity Soil blowing
Blacksheep	Depth to rock Lime content Limited available water capacity Soil blowing
671B:	
Bearpaw	Soil blowing
Vida	Lime content Soil blowing
671C:	
Bearpaw	Water erosion Soil blowing
Vida	Water erosion Lime content Soil blowing
671D:	
Bearpaw	Water erosion Slope Soil blowing
Vida	Water erosion Lime content Slope Soil blowing
674B:	
Bearpaw	Soil blowing
Waltham	Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing
696C:	
Vida	Water erosion Lime content Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
696C: (cont.)	
Zahill	Water erosion Lime content Soil blowing
Bearpaw	Water erosion Soil blowing
701D:	
Yetull	Water erosion Excessive permeability Lime content Limited available water capacity Potential for ground-water pollution Slope Soil blowing
Busby	Water erosion Excessive permeability Potential for ground-water pollution Slope Soil blowing
721E:	
Zahill	Water erosion Lime content Slope Soil blowing
Vida	Water erosion Lime content Slope Soil blowing
722D:	
Zahill	Water erosion Lime content Slope Soil blowing
Vida	Water erosion Lime content Slope Soil blowing
725F:	
Zahill	Areas of rock outcrop Water erosion Lime content Slope Soil blowing
Rock outcrop	Nonsoil material
729F:	
Zahill	Water erosion Lime content Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
729F: (cont.)	
Obrien	Water erosion Slope Soil blowing
732C:	
Yetull	Excessive permeability Limited available water capacity Potential for ground-water pollution Soil blowing
Lonesome	Water erosion Excessive permeability Potential for ground-water pollution Soil blowing
761D:	
Hedoes	Water erosion Short frost-free period Slope Soil blowing
Belain	Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing
761F:	
Hedoes	Water erosion Short frost-free period Slope Soil blowing
Belain	Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing
763E:	
Laceycreek	Water erosion Short frost-free period Slope Soil blowing
791C:	
Yamacall	Water erosion Lime content Soil blowing
Hillon	Water erosion Lime content Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
795C:	
Yamacall	Water erosion Lime content Soil blowing
Benz	Water erosion Lime content Salt content Sodium content Soil blowing Surface crusting
799C:	
Yamacall	Water erosion Lime content Soil blowing
801B:	
Williams	Soil blowing
Vida	Lime content Soil blowing
801C:	
Williams	Water erosion Soil blowing
Vida	Water erosion Lime content Soil blowing
812A:	
Glendive	Lime content Soil blowing
831A:	
Straw	Short frost-free period Soil blowing
Korchea	Lime content Short frost-free period Soil blowing
832A:	
Nesda	Excessive permeability Flooding Limited available water capacity Potential for ground-water pollution Short frost-free period Soil blowing Surface rock fragments
Nesda	Excessive permeability Limited available water capacity Potential for ground-water pollution Short frost-free period Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
833A:	
Enbar	Flooding Short frost-free period Soil blowing Water table
Straw	Short frost-free period Soil blowing
Eagleton	Flooding Potential for ground-water pollution Short frost-free period Soil blowing Water table
842A:	
Bullhook	Lime content Poor tilth Salt content Sodium content Soil blowing Surface crusting
Nobe	Lime content Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting Water table
883F:	
Perma	Water erosion Limited available water capacity Short frost-free period Slope Soil blowing Surface rock fragments
Whitlash	Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing Surface rock fragments
892F:	
Whitlash	Areas of rock outcrop Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
892F: (cont.)	
Belain	Areas of rock outcrop Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing
Rock outcrop	Nonsoil material
895F:	
Whitlash	Areas of rock outcrop Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing
Perma	Areas of rock outcrop Water erosion Limited available water capacity Short frost-free period Slope Soil blowing
Rock outcrop	Nonsoil material
896F:	
Perma	Areas of rock outcrop Water erosion Limited available water capacity Short frost-free period Slope Soil blowing
Whitlash	Areas of rock outcrop Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing
Rock outcrop	Nonsoil material
899F:	
Zahill	Areas of rock outcrop Water erosion Lime content Slope Soil blowing
Rock outcrop	Nonsoil material

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
899F: (cont.)	
Whitlash	Areas of rock outcrop Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Slope Soil blowing
911F:	
Belain	Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing
Whitlash	Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing
Hedoes	Water erosion Short frost-free period Slope Soil blowing
915F:	
Belain	Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing
Whitlash	Depth to rock Water erosion Limited available water capacity Potential for ground-water pollution Short frost-free period Slope Soil blowing
Hedoes	Water erosion Short frost-free period Slope Soil blowing
951B:	
Kenilworth	Soil blowing
Fortbenton	Soil blowing

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
962B:	
Fortbenton	Soil blowing
965B:	
Fortbenton	Soil blowing
Chinook	Soil blowing
968C:	
Fortbenton	Water erosion Soil blowing
Hillon	Water erosion Lime content Soil blowing
968D:	
Hillon	Water erosion Lime content Slope Soil blowing
Fortbenton	Water erosion Slope Soil blowing
971F:	
Neldore	Depth to rock Water erosion Limited available water capacity Poor tilth Slope Soil blowing
Bascovy	Depth to rock Water erosion Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
974F:	
Neldore	Depth to rock Water erosion Limited available water capacity Poor tilth Slope Soil blowing
Hillon	Water erosion Lime content Slope Soil blowing
DA:	
Denied access	Nonsoil material

Main Cropland Limitations and Hazards--Continued

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
M-W:	
Miscellaneous water	Nonsoil material
W:	
Water	Nonsoil material

Land Capability and Yields per Acre of Crops

(Yields in the "N" columns are for nonirrigated soils; those in the "I" column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
13A: McKenzie	6W	---	---	---	---	---	---	---	---	---	---	---
16B: Degrand	3E	2E	26.0	51.0	30.0	51.0	45.0	80.0	---	---	1.3	4.5
22E: Hillon	6E	---	---	---	---	---	---	---	---	---	---	---
22F: Hillon	7E	---	---	---	---	---	---	---	---	---	---	---
24A: Hanly	4E	4E	23.0	36.0	---	36.0	---	45.0	---	---	---	3.0
27B: Attewan	3E	3E	26.0	70.0	30.0	70.0	45.0	80.0	---	---	---	5.0
28A: Nishon	4W	---	25.0	---	28.0	---	43.0	---	---	---	---	---
30A: Marvan	4E	4E	28.0	35.0	31.0	---	47.0	45.0	0.6	1.8	0.5	2.0
30C: Marvan	4E	4E	28.0	---	31.0	---	47.0	35.0	0.5	---	0.5	---
31A: Ferd	3E	---	42.0	---	48.0	---	68.0	---	---	---	---	---
32A: Kobase	3E	3E	36.0	50.0	41.0	---	60.0	65.0	1.2	3.0	1.0	5.0
33A: Phillips	3E	---	42.0	---	48.0	---	68.0	---	1.2	---	1.1	---
34A: Dimmick	5W	---	29.0	---	32.0	---	49.0	---	---	---	---	---
36A: Chinook	4E	4E	31.0	55.0	34.0	---	52.0	80.0	1.2	3.0	1.0	4.5
36C: Chinook	4E	4E	31.0	50.0	34.0	---	52.0	72.0	1.0	3.0	0.8	3.5
37A: Evanston	3E	2E	42.0	50.0	46.0	---	67.0	70.0	---	---	1.5	5.5
51A: Wheatbelt	6W	---	17.0	---	19.0	---	32.0	---	---	---	---	---
53D: Beaverton	6E	---	18.0	---	20.0	---	34.0	---	---	---	---	---

Land Capability and Yields per Acre of Crops--Continued

(Yields in the "N" columns are for nonirrigated soils; those in the "I" column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
55A:												
Benz	6S	---	---	---	---	---	---	---	---	---	---	---
60A:												
Havre	3E	2E	35.0	---	40.0	55.0	58.0	80.0	1.5	3.0	1.8	7.0
62C:												
Weingart	6E	---	---	---	---	---	---	---	---	---	---	---
Weingart, thin surface	6E	---	---	---	---	---	---	---	---	---	---	---
72F:												
Zahill	7E	---	---	---	---	---	---	---	---	---	---	---
74B:												
Marias	4E	---	30.0	---	33.0	---	50.0	---	---	---	---	---
75B:												
Farnuf	3E	3E	42.0	---	47.0	---	68.0	75.0	1.8	3.0	2.0	5.5
75C:												
Farnuf	3E	3E	42.0	---	47.0	---	68.0	70.0	1.6	2.8	1.8	5.3
76B:												
Bowery	3E	---	56.0	---	63.0	---	90.0	---	---	---	---	---
76C:												
Bowery	3E	---	56.0	---	63.0	---	90.0	---	---	---	---	---
76D:												
Bowery	4E	---	54.0	---	61.0	---	86.0	---	---	---	---	---
78A:												
Lostriver	6S	---	---	---	---	---	---	---	---	---	---	---
79B:												
Yamacall	4E	4E	37.0	48.0	42.0	---	61.0	60.0	---	---	1.5	5.5
81A:												
Glendive	4E	4E	28.0	65.0	32.0	70.0	48.0	75.0	---	---	---	5.0
84A:												
Bullhook	6S	---	---	---	---	---	---	---	---	---	---	---
90A:												
Harlake	4E	---	35.0	---	39.0	---	58.0	---	---	---	---	---
92B:												
Marmarth	3E	---	33.0	---	37.0	---	54.0	---	---	---	---	---
93D:												
Tally	4E	---	37.0	---	41.0	---	60.0	---	---	---	1.0	---

Land Capability and Yields per Acre of Crops--Continued

(Yields in the "N" columns are for nonirrigated soils; those in the "I" column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
96B:												
Fortbenton	4E	---	35.0	---	39.0	---	58.0	---	---	---	---	---
96C:												
Fortbenton	4E	---	35.0	---	39.0	---	58.0	---	---	---	---	---
98B:												
Kremlin	3E	---	44.0	---	50.0	---	71.0	---	---	---	1.0	---
99A:												
Thibadeau	6W	---	---	---	---	---	---	---	---	---	---	---
110D:												
Laceycreek	4E	---	50.0	---	56.0	---	81.0	---	---	---	---	---
115B:												
Thoeny	4S	---	21.0	---	24.0	---	37.0	---	---	---	---	---
Elloam	6S	---	17.0	---	19.0	---	32.0	---	---	---	---	---
171C:												
Delpoint	4E	---	29.0	---	32.0	---	49.0	---	---	---	0.8	---
Cabbart	6E	---	17.0	---	19.0	---	32.0	---	---	---	---	---
172C:												
Delpoint, calcareous	4E	---	29.0	---	32.0	---	49.0	---	---	---	0.8	---
Delpoint	3E	---	31.0	---	35.0	---	52.0	---	1.0	---	0.8	---
182F:												
Garlet	7E	---	---	---	---	---	---	---	---	---	---	---
Elkner	7E	---	---	---	---	---	---	---	---	---	---	---
191F:												
Winkler	7E	---	---	---	---	---	---	---	---	---	---	---
Ambrant	7E	---	---	---	---	---	---	---	---	---	---	---
Winkler, dry	7E	---	---	---	---	---	---	---	---	---	---	---
200F:												
Badland.												
203F:												
Cabba	7E	---	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
204F:												
Cabba	7E	---	---	---	---	---	---	---	---	---	---	---
Zahill	7E	---	---	---	---	---	---	---	---	---	---	---

Land Capability and Yields per Acre of Crops--Continued

(Yields in the "N" columns are for nonirrigated soils; those in the "I" column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
205F:												
Cabba	7E	---	---	---	---	---	---	---	---	---	---	---
Macar	7E	---	---	---	---	---	---	---	---	---	---	---
211F:												
Cabbart	7E	---	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
212F:												
Cabbart	7E	---	---	---	---	---	---	---	---	---	---	---
Hillon	7E	---	---	---	---	---	---	---	---	---	---	---
213E:												
Cabbart	7E	---	10.0	---	11.0	---	21.0	---	---	---	---	---
Yawdim	7E	---	3.0	---	3.0	---	1.0	---	---	---	---	---
221D:												
Hillon	4E	---	37.0	---	40.0	---	59.0	---	---	---	1.3	---
Kevin	4E	---	39.0	---	45.0	---	64.0	---	---	---	---	---
224D:												
Hillon	4E	---	37.0	---	41.0	---	61.0	---	---	---	1.3	---
Joplin	4E	---	38.0	---	43.0	---	61.0	---	---	---	---	---
241A:												
Hanly	4W	4W	23.0	36.0	---	36.0	---	45.0	---	---	---	3.0
251D:												
Bascovy	4E	---	18.0	---	20.0	---	34.0	---	---	---	---	---
Neldore	6E	---	10.0	---	11.0	---	21.0	---	---	---	---	---
262A:												
Absher	7S	---	---	---	---	---	---	---	---	---	---	---
Gerdrum	6S	---	17.0	---	19.0	---	32.0	---	---	---	---	---
272C:												
Attewan	3E	3E	26.0	70.0	30.0	70.0	45.0	80.0	---	---	---	5.0
Tinsley	7S	---	8.0	---	7.0	---	16.0	---	---	---	---	---
304A:												
Marvan	6S	---	---	---	---	---	5.0	---	---	---	---	---
Nobe	7S	---	---	---	---	---	---	---	---	---	---	---

Land Capability and Yields per Acre of Crops--Continued

(Yields in the "N" columns are for nonirrigated soils; those in the "I" column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
309A:												
Marvan, saline--	6S	---	---	---	---	---	5.0	---	---	---	---	---
Marvan----------	4E	4E	28.0	35.0	31.0	---	47.0	45.0	0.6	1.8	0.5	2.0
311B:												
Ferd------------	3E	---	37.0	---	42.0	---	61.0	---	---	---	---	---
Creed-----------	4S	---	19.0	---	21.0	---	35.0	---	---	---	---	---
Gerdrum---------	6S	---	17.0	---	19.0	---	32.0	---	---	---	---	---
321A:												
Kobase----------	4E	4E	33.0	45.0	37.0	---	56.0	60.0	1.2	3.0	1.0	5.0
331B:												
Phillips--------	3E	---	36.0	---	40.0	---	59.0	---	1.2	---	1.1	---
Elloam----------	6S	---	17.0	---	19.0	---	32.0	---	---	---	---	---
334B:												
Phillips--------	3E	---	36.0	---	40.0	---	59.0	---	1.2	---	1.1	---
Kevin-----------	3E	3E	36.0	---	41.0	---	60.0	---	---	---	1.0	3.8
362C:												
Chinook---------	4E	4E	31.0	50.0	34.0	---	52.0	72.0	1.0	3.0	0.8	3.5
Yetull----------	6E	---	16.0	---	17.0	---	29.0	---	---	---	---	---
375B:												
Evanston--------	3E	2E	42.0	50.0	46.0	---	67.0	70.0	---	---	1.5	5.5
Lonna-----------	4E	4E	39.0	46.0	44.0	---	64.0	55.0	1.1	3.5	1.5	5.0
381A:												
Ethridge--------	3E	3E	42.0	50.0	48.0	---	68.0	65.0	1.2	3.0	1.5	5.5
400F:												
Rubble land.												
Rock outcrop.												
402A:												
Gerdrum---------	6S	---	16.0	---	17.0	---	29.0	---	---	---	---	---
Absher----------	7S	---	---	---	---	---	---	---	---	---	---	---
Creed-----------	4S	---	17.0	---	19.0	---	32.0	---	---	---	---	---
421C:												
Joplin----------	3E	---	41.0	---	45.0	---	65.0	---	---	---	---	5.0
Hillon----------	4E	---	39.0	---	45.0	---	64.0	---	---	---	1.5	---

Land Capability and Yields per Acre of Crops--Continued

(Yields in the "N" columns are for nonirrigated soils; those in the "I" column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
441C:												
Kevin	3E	---	43.0	---	48.0	---	69.0	---	---	---	1.0	3.8
Hillon	4E	---	39.0	---	44.0	---	64.0	---	---	---	1.5	---
442C:												
Kevin	3E	---	36.0	---	41.0	---	60.0	---	---	---	1.0	3.8
Elloam	6S	---	17.0	---	19.0	---	32.0	---	---	---	---	---
501B:												
Telstad	3E	3E	43.0	---	49.0	---	69.0	---	1.1	3.5	1.5	5.0
Hillon	4E	---	39.0	---	45.0	---	64.0	---	---	---	1.5	---
503B:												
Telstad	3E	3E	43.0	---	49.0	---	69.0	---	1.1	3.5	1.5	5.0
Joplin	3E	3E	41.0	55.0	45.0	---	65.0	75.0	---	---	1.5	5.5
503C:												
Telstad	3E	3E	43.0	---	49.0	---	69.0	---	1.1	3.0	1.3	4.5
Joplin	3E	3E	41.0	---	45.0	---	65.0	---	---	---	---	5.0
522A:												
Elloam	6S	---	17.0	---	19.0	---	32.0	---	---	---	---	---
Absher	7S	---	---	---	---	---	---	---	---	---	---	---
530F:												
Warwood	6E	---	---	---	---	---	---	---	---	---	---	---
561B:												
Scobey	3E	---	42.0	---	48.0	---	68.0	---	---	---	1.5	---
Kevin	3E	3E	43.0	---	48.0	---	69.0	---	---	---	1.0	3.8
561C:												
Scobey	3E	---	42.0	---	48.0	---	68.0	---	---	---	1.3	---
Kevin	3E	3E	43.0	---	48.0	---	69.0	---	---	---	1.0	3.8
564B:												
Scobey	3E	---	42.0	---	48.0	---	68.0	---	---	---	1.5	---
Hillon	4E	---	39.0	---	44.0	---	64.0	---	---	---	1.5	---
571D:												
Chinook	4E	---	31.0	---	34.0	---	52.0	---	0.8	---	0.6	---
Cozberg	4E	---	22.0	---	25.0	---	38.0	---	---	---	---	---
Yetull	4E	---	18.0	---	20.0	---	34.0	---	---	---	---	---

Land Capability and Yields per Acre of Crops--Continued

(Yields in the "N" columns are for nonirrigated soils; those in the "I" column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
573B:												
Cozberg	4E	---	22.0	---	25.0	---	38.0	---	---	---	---	---
Chinook	4E	4E	31.0	55.0	34.0	---	52.0	80.0	1.2	3.0	1.0	4.5
603A:												
Havre	4E	4E	32.0	---	35.0	---	53.0	80.0	1.5	3.0	1.8	7.0
Harlake	4E	4E	32.0	54.0	35.0	---	53.0	63.0	1.3	3.0	1.5	6.0
604A:												
Havre	3W	2W	35.0	68.0	40.0	55.0	58.0	80.0	1.5	3.0	2.0	5.5
Glendive	4W	4W	27.0	60.0	30.0	---	46.0	70.0	---	---	1.4	4.0
611B:												
Hingham	3E	---	43.0	---	49.0	---	69.0	---	---	---	---	---
Lonna	4E	4E	39.0	46.0	44.0	---	64.0	55.0	1.1	3.5	1.5	5.0
661C:												
Twilight	4E	---	28.0	---	31.0	---	47.0	---	---	---	1.0	---
Blacksheep	6E	---	16.0	---	17.0	---	29.0	---	---	---	---	---
671B:												
Bearpaw	3E	3E	42.0	65.0	47.0	70.0	69.0	90.0	1.0	---	2.0	5.5
Vida	3E	---	38.0	---	42.0	---	62.0	---	1.1	---	2.0	---
671C:												
Bearpaw	3E	---	42.0	---	47.0	---	69.0	---	1.0	---	2.0	---
Vida	3E	---	38.0	---	42.0	---	62.0	---	1.0	---	1.8	---
671D:												
Bearpaw	4E	---	37.0	---	42.0	---	61.0	---	---	---	---	---
Vida	4E	---	35.0	---	40.0	---	58.0	---	0.9	---	1.4	---
674B:												
Bearpaw	3E	3E	42.0	65.0	47.0	70.0	69.0	90.0	1.0	---	2.0	5.5
Waltham	6S	---	29.0	---	32.0	---	49.0	---	---	---	---	---
696C:												
Vida	3E	---	38.0	---	42.0	---	62.0	---	1.0	---	1.8	---
Zahill	4E	---	39.0	---	44.0	---	63.0	---	0.9	---	1.4	---
Bearpaw	3E	---	42.0	---	47.0	---	69.0	---	1.0	---	2.0	---

Land Capability and Yields per Acre of Crops--Continued

(Yields in the "N" columns are for nonirrigated soils; those in the "I" column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
701D:												
Yetull	4E	---	18.0	---	21.0	---	33.0	---	---	---	---	---
Busby	4E	---	33.0	---	37.0	---	54.0	---	---	---	---	---
721E:												
Zahill	6E	---	---	---	---	---	---	---	---	---	---	---
Vida	6E	---	---	---	---	---	---	---	---	---	---	---
722D:												
Zahill	4E	---	36.0	---	41.0	---	60.0	---	0.7	---	1.2	---
Vida	4E	---	35.0	---	40.0	---	58.0	---	0.9	---	1.4	---
725F:												
Zahill	7E	---	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
729F:												
Zahill	7E	---	---	---	---	---	---	---	---	---	---	---
Obrien	7E	---	---	---	---	---	---	---	---	---	---	---
732C:												
Yetull	6E	---	14.0	---	16.0	---	27.0	---	---	---	---	---
Lonesome	6E	---	25.0	---	27.0	---	43.0	---	---	---	---	---
761D:												
Hedoes	4E	---	45.0	---	51.0	---	74.0	---	---	---	---	---
Belain	4E	4E	31.0	---	34.0	---	52.0	---	1.0	1.5	2.0	3.0
761F:												
Hedoes	6E	---	---	---	---	---	---	---	---	---	---	---
Belain	6E	---	---	---	---	---	---	---	---	---	---	---
763E:												
Laceycreek	6E	---	44.0	---	50.0	---	73.0	---	---	---	---	---
791C:												
Yamacall	4E	4E	42.0	42.0	48.0	---	68.0	80.0	---	---	1.3	4.5
Hillon	4E	4E	39.0	---	45.0	---	64.0	---	---	---	1.5	4.0
795C:												
Yamacall	4E	4E	37.0	42.0	42.0	---	61.0	75.0	---	---	1.3	4.5
Benz	6E	---	---	---	---	---	---	---	---	---	---	---
799C:												
Yamacall	4E	4E	37.0	42.0	42.0	---	61.0	75.0	---	---	1.3	4.5

Land Capability and Yields per Acre of Crops--Continued

(Yields in the "N" columns are for nonirrigated soils; those in the "I" column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
801B:												
Williams	3E	---	44.0	---	49.0	---	72.0	---	---	---	---	---
Vida	3E	---	38.0	---	43.0	---	62.0	---	1.1	---	2.0	---
801C:												
Williams	3E	---	44.0	---	49.0	---	72.0	---	---	---	---	---
Vida	3E	---	38.0	---	43.0	---	62.0	---	1.0	---	1.8	---
812A:												
Glendive	4E	4E	27.0	55.0	31.0	60.0	47.0	65.0	---	---	---	4.0
831A:												
Straw	4E	4E	51.0	---	57.0	50.0	81.0	70.0	---	---	2.5	5.5
Korchea	4E	4E	43.0	52.0	48.0	---	70.0	80.0	1.8	3.0	1.8	5.0
832A:												
Nesda	6W	---	19.0	---	21.0	---	35.0	---	---	---	---	---
Nesda	6S	---	23.0	---	26.0	---	39.0	---	---	---	---	---
833A:												
Enbar	4W	---	53.0	---	60.0	---	85.0	---	1.8	---	---	---
Straw	4E	4E	51.0	---	57.0	50.0	81.0	70.0	---	---	2.5	5.5
Eagleton	5W	---	---	---	---	---	---	---	---	---	---	---
842A:												
Bullhook	6S	---	---	---	---	---	---	---	---	---	---	---
Nobe	7S	---	---	---	---	---	---	---	---	---	---	---
883F:												
Perma	7E	---	---	---	---	---	---	---	---	---	---	---
Whitlash	7E	---	---	---	---	---	---	---	---	---	---	---
892F:												
Whitlash	7E	---	---	---	---	---	---	---	---	---	---	---
Belain	7E	---	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
895F:												
Whitlash	7E	---	---	---	---	---	---	---	---	---	---	---
Perma	7E	---	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												

Land Capability and Yields per Acre of Crops--Continued

(Yields in the "N" columns are for nonirrigated soils; those in the "I" column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
896F:												
Perma-----------	7E	---	---	---	---	---	---	---	---	---	---	---
Whitlash--------	7E	---	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
899F:												
Zahill----------	7E	---	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
Whitlash--------	7E	---	---	---	---	---	---	---	---	---	---	---
911F:												
Belain----------	7E	---	---	---	---	---	---	---	---	---	---	---
Whitlash--------	7E	---	---	---	---	---	---	---	---	---	---	---
Hedoes----------	6E	---	---	---	---	---	---	---	---	---	---	---
915F:												
Belain----------	7E	---	---	---	---	---	---	---	---	---	---	---
Whitlash--------	7E	---	---	---	---	---	---	---	---	---	---	---
Hedoes----------	6E	---	---	---	---	---	---	---	---	---	---	---
951B:												
Kenilworth------	4E	---	37.0	---	42.0	---	61.0	---	---	---	---	---
Fortbenton------	4E	---	35.0	---	39.0	---	58.0	---	---	---	---	---
962B:												
Fortbenton------	3E	---	38.0	---	44.0	---	63.0	---	---	---	---	---
965B:												
Fortbenton------	4E	---	35.0	---	39.0	---	58.0	---	---	---	---	---
Chinook---------	4E	4E	31.0	55.0	34.0	---	52.0	80.0	1.2	3.0	1.0	4.5
968C:												
Fortbenton------	4E	---	39.0	---	44.0	---	64.0	---	---	---	---	---
Hillon----------	4E	---	39.0	---	45.0	---	64.0	---	---	---	1.5	---
968D:												
Hillon----------	6E	---	27.0	---	31.0	---	47.0	---	---	---	---	---
Fortbenton------	6E	---	27.0	---	30.0	---	46.0	---	---	---	---	---

Land Capability and Yields per Acre of Crops--Continued

(Yields in the "N" columns are for nonirrigated soils; those in the "I" column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
971F:												
Neldore---------	7E	---	---	---	---	---	---	---	---	---	---	---
Bascovy---------	7E	---	---	---	---	---	---	---	---	---	---	---
974F:												
Neldore---------	7E	---	---	---	---	---	---	---	---	---	---	---
Hillon----------	7E	---	---	---	---	---	---	---	---	---	---	---
DA:												
Denied access.												
M-W:												
Miscellaneous water.												
W:												
Water.												

Prime Farmland

Map Symbol	Soil name
16B	Degrand loam, 0 to 4 percent slopes (where irrigated)
27B	Attewan loam, 0 to 4 percent slopes (where irrigated)
32A	Kobase clay loam, 0 to 2 percent slopes (where irrigated)
37A	Evanston loam, 0 to 2 percent slopes (where irrigated)
60A	Havre loam, 0 to 2 percent slopes (where irrigated)
75B	Farnuf loam, 0 to 4 percent slopes (where irrigated)
76B	Bowery loam, 0 to 4 percent slopes (where irrigated)
* 81A	Glendive fine sandy loam, 0 to 2 percent slopes (where irrigated)
* 90A	Harlake clay, 0 to 2 percent slopes (where irrigated)
92B	Marmarth loam, 0 to 4 percent slopes (where irrigated)
98B	Kremlin loam, 0 to 4 percent slopes (where irrigated)
381A	Ethridge clay loam, 0 to 2 percent slopes (where irrigated)
503B	Telstad-Joplin loams, 0 to 4 percent slopes (where irrigated)
561B	Scobey-Kevin clay loams, 0 to 4 percent slopes (where irrigated)
* 603A	Havre-Harlake clay loams, 0 to 2 percent slopes (where irrigated)
* 604A	Havre-Glendive complex, 0 to 2 percent slopes (where irrigated)
671B	Bearpaw-Vida clay loams, 0 to 4 percent slopes (where irrigated)
801B	Williams-Vida loams, 0 to 4 percent slopes (where irrigated)
* 812A	Glendive fine sandy loam, calcareous, 0 to 2 percent slopes (where irrigated)
831A	Straw-Korchea loams, 0 to 2 percent slopes (where irrigated)
962B	Fortbenton loam, 0 to 4 percent slopes (where irrigated)

* Only irrigated areas that the product of soil erodibility (I) and climate (C) does not exceed 60 are prime farmland.

Windbreak Suitability Groups

(Suitable shrubs and trees with their mature heights are listed in the adjoining Windbreak Suitability Group Species List. Absence of an entry indicates that a windbreak suitability group is not assigned. A dashed entry indicates a woodland unit and a windbreak suitability group is not assigned.)

Soil name and map symbol	Windbreak suitability group
13A:	
McKenzie	4
16B:	
Degrand	3M
22E:	
Hillon	4
22F:	
Hillon	4
24A:	
Hanly	3M
27B:	
Attewan	3M
28A:	
Nishon	4
30A:	
Marvan	2S
30C:	
Marvan	2S
31A:	
Ferd	1
32A:	
Kobase	1
33A:	
Phillips	1
34A:	
Dimmick	4
36A:	
Chinook	2M
36C:	
Chinook	2M
37A:	
Evanston	1
51A:	
Wheatbelt	4
53D:	
Beaverton	3M

Windbreak Suitability Groups--Continued

(Suitable shrubs and trees with their mature heights are listed in the adjoining Windbreak Suitability Group Species List. Absence of an entry indicates that a windbreak suitability group is not assigned. A dashed entry indicates a woodland unit and a windbreak suitability group is not assigned.)

Soil name and map symbol	Windbreak suitability group
55A:	
Benz	3S
60A:	
Havre	1
62C:	
Weingart	3S
Weingart, thin surface	3S
72F:	
Zahill	4
74B:	
Marias	2M
75B:	
Farnuf	1
75C:	
Farnuf	1
76B:	
Bowery	1
76C:	
Bowery	1
76D:	
Bowery	1
78A:	
Lostriver	3S
79B:	
Yamacall	1
81A:	
Glendive	2M
84A:	
Bullhook	3S
90A:	
Harlake	2M
92B:	
Marmarth	3M
93D:	
Tally	2M
96B:	
Fortbenton	1
96C:	
Fortbenton	1

Windbreak Suitability Groups--Continued

(Suitable shrubs and trees with their mature heights are listed in the adjoining Windbreak Suitability Group Species List. Absence of an entry indicates that a windbreak suitability group is not assigned. A dashed entry indicates a woodland unit and a windbreak suitability group is not assigned.)

Soil name and map symbol	Windbreak suitability group
98B:	
Kremlin	1
99A:	
Thibadeau	4
110D:	
Laceycreek	1
115B:	
Thoeny	2S
Elloam	3S
171C:	
Delpoint	2M
Cabbart	4
172C:	
Delpoint, calcareous	2M
Delpoint	2M
182F:	
Garlet	--
Elkner	--
191F:	
Winkler	--
Ambrant	--
Winkler,dry	--
200F:	
Badland	4
203F:	
Cabba	4
Rock outcrop	4
204F:	
Cabba	4
Zahill	4
205F:	
Cabba	4
Macar	4
211F:	
Cabbart	4
Rock outcrop	4
212F:	
Cabbart	4
Hillon	4
213E:	
Cabbart	4
Yawdim	4

Windbreak Suitability Groups--Continued

(Suitable shrubs and trees with their mature heights are listed in the adjoining Windbreak Suitability Group Species List. Absence of an entry indicates that a windbreak suitability group is not assigned. A dashed entry indicates a woodland unit and a windbreak suitability group is not assigned.)

Soil name and map symbol	Windbreak suitability group
221D:	
Hillon	1
Kevin	1
224D:	
Hillon	1
Joplin	1
241A:	
Hanly	--
251D:	
Bascovy	3M
Neldore	4
262A:	
Absher	4
Gerdrum	3S
272C:	
Attewan	3M
Tinsley	4
304A:	
Marvan	3S
Nobe	4
309A:	
Marvan, saline	3S
Marvan	2S
311B:	
Ferd	1
Creed	2S
Gerdrum	3S
321A:	
Kobase	1
331B:	
Phillips	1
Elloam	3S
334B:	
Phillips	1
Kevin	1
362C:	
Chinook	2M
Yetull	3M
375B:	
Evanston	1
Lonna	1
381A:	
Ethridge	1

Windbreak Suitability Groups--Continued

(Suitable shrubs and trees with their mature heights are listed in the adjoining Windbreak Suitability Group Species List. Absence of an entry indicates that a windbreak suitability group is not assigned. A dashed entry indicates a woodland unit and a windbreak suitability group is not assigned.)

Soil name and map symbol	Windbreak suitability group
400F:	
Rubble land	4
Rock outcrop	4
402A:	
Gerdrum	3S
Absher	4
Creed	2S
421C:	
Joplin	1
Hillon	1
441C:	
Kevin	1
Hillon	1
442C:	
Kevin	1
Elloam	3S
501B:	
Telstad	1
Hillon	1
503B:	
Telstad	1
Joplin	1
503C:	
Telstad	1
Joplin	1
522A:	
Elloam	3S
Absher	4
530F:	
Warwood	--
561B:	
Scobey	1
Kevin	1
561C:	
Scobey	1
Kevin	1
564B:	
Scobey	1
Hillon	1
571D:	
Chinook	2M
Cozberg	3M
Yetull	3M

Windbreak Suitability Groups--Continued

(Suitable shrubs and trees with their mature heights are listed in the adjoining Windbreak Suitability Group Species List. Absence of an entry indicates that a windbreak suitability group is not assigned. A dashed entry indicates a woodland unit and a windbreak suitability group is not assigned.)

Soil name and map symbol	Windbreak suitability group
573B:	
Cozberg	3M
Chinook	2M
603A:	
Havre	1
Harlake	1
604A:	
Havre	1
Glendive	2M
611B:	
Hingham	1
611B:	
Lonna	1
661C:	
Twilight	3M
Blacksheep	4
671B:	
Bearpaw	1
Vida	1
671C:	
Bearpaw	1
Vida	1
671D:	
Bearpaw	1
Vida	1
674B:	
Bearpaw	1
Waltham	3S
696C:	
Vida	1
Zahill	1
Bearpaw	1
701D:	
Yetull	3M
Busby	2M
721E:	
Zahill	4
Vida	4
722D:	
Zahill	1
Vida	1

Windbreak Suitability Groups--Continued

(Suitable shrubs and trees with their mature heights are listed in the adjoining Windbreak Suitability Group Species List. Absence of an entry indicates that a windbreak suitability group is not assigned. A dashed entry indicates a woodland unit and a windbreak suitability group is not assigned.)

Soil name and map symbol	Windbreak suitability group
725F:	
Zahill	4
Rock outcrop	4
729F:	
Zahill	4
Obrien	4
732C:	
Yetull	3M
Lonesome	2M
761D:	
Hedoes	2M
Belain	3M
761F:	
Hedoes	4
Belain	4
763E:	
Laceycreek	--
791C:	
Yamacall	1
Hillon	1
795C:	
Yamacall	1
Benz	3S
799C:	
Yamacall	1
801B:	
Williams	1
Vida	1
801C:	
Williams	1
Vida	1
812A:	
Glendive	2M
831A:	
Straw	2M
Korchea	2M
832A:	
Nesda	--
Nesda	--

Windbreak Suitability Groups--Continued

(Suitable shrubs and trees with their mature heights are listed in the adjoining Windbreak Suitability Group Species List. Absence of an entry indicates that a windbreak suitability group is not assigned. A dashed entry indicates a woodland unit and a windbreak suitability group is not assigned.)

Soil name and map symbol	Windbreak suitability group
833A:	
Enbar	2W
Straw	2M
Eagleton	3W
842A:	
Bullhook	3S
Nobe	4
883F:	
Perma	4
Whitlash	4
892F:	
Whitlash	4
Belain	4
Rock outcrop	4
895F:	
Whitlash	4
Perma	4
Rock outcrop	4
896F:	
Perma	4
Whitlash	--
Rock outcrop	4
899F:	
Zahill	4
Rock outcrop	4
Whitlash	4
911F:	
Belain	4
Whitlash	--
Hedoes	4
915F:	
Belain	4
Whitlash	4
Hedoes	4
951B:	
Kenilworth	1
Fortbenton	1
962B:	
Fortbenton	1
965B:	
Fortbenton	1
Chinook	2M
968C:	
Fortbenton	1
Hillon	1

Windbreak Suitability Groups--Continued

(Suitable shrubs and trees with their mature heights are listed in the adjoining Windbreak Suitability Group Species List. Absence of an entry indicates that a windbreak suitability group is not assigned. A dashed entry indicates a woodland unit and a windbreak suitability group is not assigned.)

Soil name and map symbol	Windbreak suitability group
968D:	
Hillon	4
Fortbenton	4
971F:	
Neldore	4
Bascovy	4
974F:	
Neldore	4
Hillon	4
DA:	
Denied access	
M-W:	
Miscellaneous water	
W:	
Water	

Windbreak Suitability Group Species List

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the height for that group. Suitability group 4 generally is not suited for windbreak development.)

Windbreak suitability group	Trees having a predicted 20-year average height, in feet				
	<8	8-15	16-25	26-35	>35
1	Western sandcherry, skunkbush sumac	Siberian peashrub, green ash, Rocky Mountain juniper, Tatarian honeysuckle, ponderosa pine, blue spruce, common chokecherry, lilac	Russian-olive, Siberian elm	---	---
2M	Western sandcherry, Nanking cherry	Siberian peashrub, green ash, Rocky Mountain juniper Siberian crabapple, ponderosa pine, blue spruce, common chokecherry, lilac	Russian-olive, Siberian elm	---	---
2S	Skunkbush sumac	Siberian peashrub, Rocky Mountain juniper, ponderosa pine, common chokecherry, silver buffaloberry	Russian-olive, Siberian elm	---	---
2W	Western sandcherry, purpleosier willow	Redosier dogwood, Siberian crabapple, common chokecherry, lilac	Russian-olive, green ash, ponderosa pine, blue spruce	Golden willow	Plains cottonwood
3M	Western sandcherry, Nanking cherry	Siberian peashrub, green ash, Rocky Mountain juniper, Tatarian honeysuckle, ponderosa pine, blue spruce, common chokecherry, lilac	Russian-olive, Siberian elm	---	---
3S	Skunkbush sumac	Siberian peashrub, silver buffaloberry	Russian-olive, Siberian elm	---	---
3W	Skunkbush sumac	Silver buffaloberry	Russian-olive	Siberian elm	---
4	---	---	---	---	---

Range

Range makes up about 33 percent of the land in Hill County. The majority of rangeland is in the Glaciated Plains North, geographical area. The Bear Paw Mountains and foothills are in the Northern Rocky Mountain Foothills, central, geographical area.

Most grazing is on native range. The range is used primarily for grazing by domestic livestock; however, it also is used for wildlife habitat, recreational areas, and watershed. Rangeland also has esthetic value.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on range are closely related to the type of soil in the areas. Effective management is based on the relationship between the soils and vegetation and water.

Range is defined as land on which the native vegetation (the climax, or natural potential, plant community) is predominantly grasses, grasslike plants, forbs, and shrubs suitable for grazing and browsing. Range includes natural grasslands, savannas, many wetlands, some deserts, tundra, and certain shrub and forb communities. Range receives no regular or frequent cultural treatment. The composition and production of the plant community are determined by soil, climate, topography, overstory canopy, and grazing management.

Grazed forest land is defined as land on which the understory includes, as an integral part of the forest plant community, plants that can be grazed without significant impairment of other forest values.

Native pasture is defined as land on which the potential (climax) vegetation is forest, but which is used and managed primarily for the production of native forage plants. Native pasture includes cutover forest land and forest land that has been cleared and is managed for native or naturalized forage plants.

The table "Rangeland Productivity and Characteristic Plant Communities" at the end of this section shows, for each listed soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in this table follows.

Range site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants.

Many different range sites are in Hill County. The combination of plants best suited to a particular soil and climate has become established over time. If the soil is not excessively disturbed, this group of plants is the natural plant community for the site. Natural plant communities are not static, but vary slightly from year to year and place to place.

The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. The "Field Office Technical Guide," which is available at local offices of the Natural Resources Conservation Service, can provide specific information about range sites.

Total production is the amount of vegetation that can be expected to grow annually on well-managed range that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to

such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation consists of the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil. The plants are listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range Condition

Range condition is based on a comparison of the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the natural community, the better the range condition.

Abnormal disturbances that change the natural plant community include repeated overuse by livestock, excessive burning, erosion, and plowing. Grazing animals select the most palatable plants. These plants will eventually die if they are continually grazed. A very severe disturbance can completely destroy the natural community. Under these conditions, the less desirable plants, such as annuals and weedlike plants, can invade. If the plant community has not deteriorated significantly, it eventually can return to dominantly natural plants if proper grazing management is applied.

Four range condition classes are used to show the degree of deterioration of the natural plant community.

An area of rangeland is in *excellent condition* if more than 75 percent of the present plant community is the same as the natural plant community. It is in *good condition* if the natural plants make up 51 to 75 percent of the present plant community, in *fair condition* if those plants make up 26 to 50 percent, and in *poor condition* if they make up less than 25 percent.

Knowledge of the range site and condition is necessary as a basis for planning and applying the management needed to maintain or improve the desired plant community for selected uses. Such information is needed to determine management objectives, proper grazing systems and stocking rates, suitable wildlife management practices, the potential for recreational uses, and the condition of watersheds.

Rangeland Management

Rangeland management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of less desirable species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Grazing management is the most important part of any rangeland management program. Proper grazing use, timely deferment of grazing, and planned rotation grazing systems are key practices. The experience of ranchers and research have shown that if no more than one-half of the current year's growth is grazed, a plant community in good or excellent condition can be maintained and one in fair condition can be improved. The remaining one-half enables plants to make and store food for regrowth and root development. As a result, the desirable plants remain healthy and are not replaced by less desirable grasses and weeds. The plant cover also protects the soil from water erosion and soil blowing, improves tilth, increases the rate of water infiltration, and helps to control runoff.

Certain practices commonly are needed to obtain a uniform distribution of grazing. These include developing livestock watering facilities, fencing, properly locating salt and mineral supplements, constructing livestock trails in steeply sloping areas, and riding or herding.

Various kinds of grazing systems can be used in range management. No single grazing system is best under all conditions. The grazing system should increase the quantity and improve the quality of the range vegetation, should meet the needs of the individual operator, and should be designed according to the topography, the type of grazing animals, and the resource management objectives.

Special improvement practices are needed in areas where management practices do not achieve the desired results or where recovery is too slow under forage management alone. These include range seeding, brush management, water spreading, prescribed burning, and mechanical treatment.

Some soils are suited to mechanical treatment for range improvement. On other soils, however, only proper grazing management can improve the range. Many soils in capability classes 1 through 4 are suited to such practices as seeding, mechanical brush and weed control, and water spreading. Those in capability classes 7 and 8, however, are not suitable. Many soils

in capability classes 1 through 4 are suited to tillage for seedbed preparation before native or introduced forage plant species are seeded. Soils in capability class 6 may be suited to limited surface disturbance, such as scarification, for the purpose of seeding and as a means of increasing the rate of water infiltration for seed germination.

Where feasible, mechanical renovation practices, such as shallow chiseling, can help to speed recovery of the desired plants. These practices open up the surface and thus allow the absorption of more moisture and production of the more desirable plants. Mechanical renovation, brush management, and timely deferment of grazing allow recovery of the desired plants.

Seeding may be needed in areas where the less desirable plants are dominant. A clean, firm seedbed should be prepared, suitable species should be selected for seeding, and rest periods should be long enough to allow the new plants to become stablished.

Special improvement practices can be effective only if the management system helps to keep the desirable plants healthy.

Forest Land Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some forest land can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

The table “Understory Vegetation and Habitat Types” at the end of this section shows, for each soil suitable for forest land, the potential for producing understory vegetation. The *total production* of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4.5 feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, soil moisture is above average during the optimal part of the growing season; in a normal year, soil moisture is average; and in an unfavorable year, it is below average.

The table also lists the common names of the *characteristic vegetation* on each soil and the *composition*, by percentage of air-dry weight, of each kind of plant. The table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of forest land in which the production of wood crops is highest.

Rangeland Productivity and Characteristic Plant Communities

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
13A:					
McKenzie	Saline Upland, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	600	Western wheatgrass	40
		Normal	500	Alkali sacaton	15
		Unfavorable	350	Inland saltgrass	15
				Nuttall saltbush	5
				Greasewood	5
				Basin wildrye	5
16B:					
Degrand	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
22E:					
Hillon	Thin Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,450	Bluebunch wheatgrass	35
		Normal	1,200	Western wheatgrass	20
		Unfavorable	850	Needleandthread	15
				Green needlegrass	10
				Plains muhly	5
22F:					
Hillon	Thin Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,450	Bluebunch wheatgrass	35
		Normal	1,200	Western wheatgrass	20
		Unfavorable	850	Needleandthread	15
				Green needlegrass	10
				Plains muhly	5
24A:					
Hanly	Sands, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,500	Prairie sandreed	40
		Normal	2,000	Indian ricegrass	20
		Unfavorable	1,500	Needleandthread	10
				Sand dropseed	5
27B:					
Attewan	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
28A:					
Nishon	Overflow, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	3,000	Western wheatgrass	30
		Normal	2,500	Basin wildrye	30
		Unfavorable	2,000	Green needlegrass	20
				Slender wheatgrass	5
30A:					
Marvan	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,600	Western wheatgrass	30
		Normal	1,100	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
30C:					
Marvan	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,600	Western wheatgrass	30
		Normal	1,100	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
31A:					
Ferd	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
32A:					
Kobase	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,500	Green needlegrass	30
		Unfavorable	1,000	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
33A:					
Phillips	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
34A:					
Dimmick	Overflow, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	3,000	Western wheatgrass	30
		Normal	2,500	Basin wildrye	30
		Unfavorable	2,000	Green needlegrass	20
				Slender wheatgrass	5
36A:					
Chinook	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
36C:					
Chinook	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
37A:					
Evanston	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,300	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
51A:					
Wheatbelt	Saline Upland, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	250	Western wheatgrass	40
		Normal	175	Alkali sacaton	15
		Unfavorable	100	Inland saltgrass	15
				Nuttall saltbush	5
				Greasewood	5
				Basin wildrye	5
53D:					
Beaverton	Shallow to Gravel, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,300	Bluebunch wheatgrass	40
		Normal	1,000	Rough fescue	20
		Unfavorable	700	Idaho fescue	10
				Western wheatgrass	5
				Needleandthread	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
55A:					
Benz	Saline Upland, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	500	Western wheatgrass	40
		Normal	300	Alkali sacaton	15
		Unfavorable	200	Inland saltgrass	15
				Nuttall saltbush	5
				Greasewood	5
				Basin wildrye	5
60A:					
Havre	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,200	Green needlegrass	20
				Needleandthread	15
62C:					
Weingart	Clay pan, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,200	Western wheatgrass	40
		Normal	1,000	Green needlegrass	20
		Unfavorable	700	Canby bluegrass	10
				Nuttall saltbush	5
				Winterfat	5
				Greasewood	5
Weingart, thin surface	Dense Clay, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	800	Western wheatgrass	35
		Normal	600	Green needlegrass	15
		Unfavorable	400	Winterfat	10
				Needleandthread	10
				Nuttall saltbush	5
				Big sagebrush	5
72F:					
Zahill	Thin Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,900	Bluebunch wheatgrass	35
		Normal	1,500	Rough fescue	20
		Unfavorable	1,100	Idaho fescue	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
74B:					
Marias	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,600	Western wheatgrass	30
		Normal	1,400	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
75B:					
Farnuf	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,100	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
75C:					
Farnuf	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,100	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
76B:					
Bowery	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,200	Bluebunch wheatgrass	30
		Normal	1,800	Rough fescue	20
		Unfavorable	1,400	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
76C:					
Bowery	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,200	Bluebunch wheatgrass	30
		Normal	1,800	Rough fescue	20
		Unfavorable	1,400	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
76D:					
Bowery	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,200	Bluebunch wheatgrass	30
		Normal	1,800	Rough fescue	20
		Unfavorable	1,400	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
78A:					
Lostriver	Saline Upland, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	250	Western wheatgrass	40
		Normal	175	Alkali sacaton	15
		Unfavorable	100	Inland saltgrass	15
				Nuttall saltbush	5
				Greasewood	5
				Basin wildrye	5
79B:					
Yamacall	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,400	Bluebunch wheatgrass	30
		Normal	1,200	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
81A:					
Glendive	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,900	Prairie sandreed	35
		Normal	1,600	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
84A:					
Bullhook	Saline Upland, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	250	Western wheatgrass	40
		Normal	175	Alkali sacaton	15
		Unfavorable	100	Inland saltgrass	15
				Nuttall saltbush	5
				Greasewood	5
				Basin wildrye	5
90A:					
Harlake	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,200	Western wheatgrass	30
		Normal	1,600	Green needlegrass	30
		Unfavorable	1,200	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
92B:					
Marmarth	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
93D:					
Tally	Sandy, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,600	Prairie sandreed	25
		Normal	2,200	Bluebunch wheatgrass	20
		Unfavorable	1,500	Idaho fescue	10
				Needleandthread	10
				Rough fescue	10
				Columbia needlegrass	5
96B:					
Fortbenton	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
96C:					
Fortbenton	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
98B:					
Kremlin	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,300	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
99A:					
Thibadeau	Saline Lowland, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	3,000	Alkali sacaton	30
		Normal	2,250	Western wheatgrass	20
		Unfavorable	1,700	Inland saltgrass	10
				Nuttall saltbush	5
				Sedge	5
				Greasewood	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
110D:					
Laceycreek	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,600	Bluebunch wheatgrass	30
		Normal	2,200	Rough fescue	20
		Unfavorable	1,800	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
115B:					
Thoeny	Clay Pan, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	600	Winterfat	10
				Needleandthread	10
				Nuttall saltbush	5
				Big sagebrush	5
Elloam	Clay Pan, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,200	Western wheatgrass	40
		Normal	900	Green needlegrass	20
		Unfavorable	500	Canby bluegrass	10
				Nuttall saltbush	5
				Winterfat	5
				Greasewood	5
171C:					
Delpoint	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,400	Bluebunch wheatgrass	30
		Normal	1,100	Western wheatgrass	25
		Unfavorable	600	Green needlegrass	20
				Needleandthread	15
Cabbart	Shallow, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5
172C:					
Delpoint, calcareous	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,400	Bluebunch wheatgrass	30
		Normal	1,100	Western wheatgrass	25
		Unfavorable	600	Green needlegrass	20
				Needleandthread	15
Delpoint	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,500	Bluebunch wheatgrass	30
		Normal	1,200	Western wheatgrass	25
		Unfavorable	700	Green needlegrass	20
				Needleandthread	15
203F:					
Cabba	Shallow, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,400	Idaho fescue	20
		Unfavorable	800	Rough fescue	15
				Western wheatgrass	10
				Green needlegrass	10
204F:					
Cabba	Shallow, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,400	Idaho fescue	20
		Unfavorable	800	Rough fescue	15
				Western wheatgrass	10
				Green needlegrass	10

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
204F: (cont.)					
Zahill	Thin Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,900	Bluebunch wheatgrass	35
		Normal	1,500	Rough fescue	20
		Unfavorable	1,100	Idaho fescue	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
205F:					
Cabba	Shallow, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,400	Idaho fescue	20
		Unfavorable	800	Rough fescue	15
				Western wheatgrass	10
				Green needlegrass	10
Macar	Thin Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,800	Bluebunch wheatgrass	35
		Normal	1,400	Rough fescue	20
		Unfavorable	1,000	Idaho fescue	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
211F:					
Cabbart	Shallow, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5
212F:					
Cabbart	Shallow, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5
Hillon	Thin Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,450	Bluebunch wheatgrass	35
		Normal	1,200	Western wheatgrass	20
		Unfavorable	850	Needleandthread	15
				Green needlegrass	10
				Plains muhly	5
213E:					
Cabbart	Shallow, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,100	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5
Yawdim	Shallow Clay, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,200	Bluebunch wheatgrass	50
		Normal	1,000	Western wheatgrass	20
		Unfavorable	700	Needleandthread	15
				Plains muhly	5
221D:					
Hillon	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo- sition
			Lb/acre		Pct
221D: (cont.)					
Kevin	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,300	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
224D:					
Hillon	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Joplin	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
251D:					
Bascovy	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
Neldore	Shallow Clay, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	700	Bluebunch wheatgrass	50
		Normal	500	Western wheatgrass	20
		Unfavorable	300	Needleandthread	15
				Plains muhly	5
262A:					
Absher	Dense Clay, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	900	Western wheatgrass	40
		Normal	600	Green needlegrass	20
		Unfavorable	400	Canby bluegrass	10
				Nuttall saltbush	5
				Winterfat	5
				Greasewood	5
Gerdrum	Clay Pan, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,100	Western wheatgrass	35
		Normal	800	Green needlegrass	15
		Unfavorable	500	Winterfat	10
				Needleandthread	10
				Nuttall saltbush	5
				Big sagebrush	5
272C:					
Attewan	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
Tinsley	Gravel, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	800	Bluebunch wheatgrass	35
		Normal	600	Needleandthread	15
		Unfavorable	400	Winterfat	10
				Western wheatgrass	10
				Plains muhly	10
				Yucca	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
304A:					
Marvan	Dense Clay, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,100	Western wheatgrass	40
		Normal	900	Alkali sacaton	15
		Unfavorable	700	Inland saltgrass	15
				Nuttall saltbush	5
				Greasewood	5
				Basin wildrye	5
Nobe	Saline Upland, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	200	Western wheatgrass	40
		Normal	150	Alkali sacaton	15
		Unfavorable	75	Inland saltgrass	15
				Nuttall saltbush	5
				Greasewood	5
				Basin wildrye	5
309A:					
Marvan, saline	Dense Clay, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,100	Western wheatgrass	40
		Normal	900	Alkali sacaton	15
		Unfavorable	700	Inland saltgrass	15
				Nuttall saltbush	5
				Greasewood	5
				Basin wildrye	5
Marvan	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,600	Western wheatgrass	30
		Normal	1,100	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
311B:					
Ferd	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Creed	Clay Pan, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,500	Western wheatgrass	35
		Normal	1,200	Green needlegrass	15
		Unfavorable	800	Winterfat	10
				Needleandthread	10
				Nuttall saltbush	5
				Big sagebrush	5
Gerdrum	Clay Pan, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,100	Western wheatgrass	40
		Normal	800	Green needlegrass	20
		Unfavorable	500	Canby bluegrass	10
				Nuttall saltbush	5
				Winterfat	5
				Greasewood	5
321A:					
Kobase	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,500	Green needlegrass	30
		Unfavorable	1,000	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
331B:					
Phillips	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Elloam	Clay Pan, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,200	Western wheatgrass	40
		Normal	900	Green needlegrass	20
		Unfavorable	500	Canby bluegrass	10
				Nuttall saltbush	5
				Winterfat	5
				Greasewood	5
334B:					
Phillips	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Kevin	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,300	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
362C:					
Chinook	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
Yetull	Sands, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,700	Prairie sandreed	35
		Normal	1,300	Needleandthread	20
		Unfavorable	900	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
375B:					
Evanston	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,300	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
Lonna	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,600	Western wheatgrass	25
		Unfavorable	1,200	Green needlegrass	20
				Needleandthread	15
381A:					
Ethridge	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
402A:					
Gerdrum	Clay Pan, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,100	Western wheatgrass	40
		Normal	800	Green needlegrass	20
		Unfavorable	500	Canby bluegrass	10
				Nuttall saltbush	5
				Winterfat	5
				Greasewood	5
Absher	Dense Clay, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	900	Western wheatgrass	40
		Normal	600	Green needlegrass	20
		Unfavorable	400	Canby bluegrass	10
				Nuttall saltbush	5
				Winterfat	5
				Greasewood	5
Creed	Clay Pan, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,500	Western wheatgrass	35
		Normal	1,200	Green needlegrass	15
		Unfavorable	800	Winterfat	10
				Needleandthread	10
				Nuttall saltbush	5
				Big sagebrush	5
421C:					
Joplin	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Hillon	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
441C:					
Kevin	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,300	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
Hillon	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
442C:					
Kevin	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,300	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
Elloam	Clay Pan, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,200	Western wheatgrass	40
		Normal	900	Green needlegrass	20
		Unfavorable	500	Canby bluegrass	10
				Nuttall saltbush	5
				Winterfat	5
				Greasewood	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
501B:					
Telstad	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Hillon	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
503B:					
Telstad	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Joplin	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
503C:					
Telstad	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Joplin	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,700	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
522A:					
Elloam	Clay Pan, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,200	Western wheatgrass	35
		Normal	900	Green needlegrass	15
		Unfavorable	500	Winterfat	10
				Needleandthread	10
				Nuttall saltbush	5
				Big sagebrush	5
Absher	Dense Clay, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	900	Western wheatgrass	40
		Normal	600	Green needlegrass	20
		Unfavorable	400	Canby bluegrass	10
				Nuttall saltbush	5
				Winterfat	5
				Greasewood	5
561B:					
Scobey	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Kevin	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,300	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
561C:					
Scobey	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Kevin	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,300	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
564B:					
Scobey	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Hillon	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
571D:					
Chinook	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Prairie sandreed	35
		Normal	1,400	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
Cozberg	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Prairie sandreed	35
		Normal	1,400	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
Yetull	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,400	Prairie sandreed	35
		Normal	2,000	Needleandthread	20
		Unfavorable	1,600	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
573B:					
Cozberg	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Prairie sandreed	35
		Normal	1,400	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
Chinook	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
603A:					
Havre	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,500	Green needlegrass	30
		Unfavorable	1,200	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
Harlake	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,350	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
604A:					
Havre	Overflow, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,500	Basin wildrye	30
		Unfavorable	1,200	Green needlegrass	20
				Slender wheatgrass	5
Glendive	Overflow, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	3,500	Western wheatgrass	30
		Normal	2,500	Basin wildrye	30
		Unfavorable	1,500	Green needlegrass	20
				Slender wheatgrass	5
611B:					
Hingham	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
Lonna	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,600	Western wheatgrass	25
		Unfavorable	1,200	Green needlegrass	20
				Needleandthread	15
661C:					
Twilight	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,600	Prairie sandreed	35
		Normal	1,300	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
Blacksheep	Shallow, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,200	Bluebunch wheatgrass	50
		Normal	900	Western wheatgrass	15
		Unfavorable	600	Needleandthread	10
				Prairie junegrass	5
				Skunkbush sumac	5
671B:					
Bearpaw	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
671B: (cont.)					
Vida	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
671C:					
Bearpaw	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Vida	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
671D:					
Bearpaw	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Vida	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
674B:					
Bearpaw	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Waltham	Clay Pan, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,500	Western wheatgrass	40
		Normal	1,100	Green needlegrass	15
		Unfavorable	800	Fourwing saltbush	10
				Winterfat	5
				Greesewood	5
				Sandberg bluegrass	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
696C:					
Vida	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Zahill	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	1,900	Rough fescue	20
		Unfavorable	1,400	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Bearpaw	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
701D:					
Yetull	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,400	Prairie sandreed	35
		Normal	2,000	Needleandthread	20
		Unfavorable	1,600	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
Busby	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
721E:					
Zahill	Thin Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,400	Bluebunch wheatgrass	35
		Normal	1,900	Rough fescue	20
		Unfavorable	1,400	Idaho fescue	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Vida	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
722D:					
Zahill	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,400	Bluebunch wheatgrass	30
		Normal	1,900	Rough fescue	20
		Unfavorable	1,400	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Vida	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
725F:					
Zahill	Thin Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,900	Bluebunch wheatgrass	35
		Normal	1,500	Rough fescue	20
		Unfavorable	1,100	Idaho fescue	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
729F:					
Zahill	Thin Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,900	Bluebunch wheatgrass	35
		Normal	1,500	Rough fescue	20
		Unfavorable	1,100	Idaho fescue	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Obrien	Silty, Steep, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,200	Rough fescue	60
		Normal	1,800	Idaho fescue	10
		Unfavorable	1,400	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5
732C:					
Yetull	Sands, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,400	Prairie sandreed	40
		Normal	2,000	Indian ricegrass	20
		Unfavorable	1,600	Needleandthread	10
				Sand dropseed	5
Lonesome	Sands, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,200	Prairie sandreed	40
		Normal	1,700	Indian ricegrass	20
		Unfavorable	1,200	Needleandthread	10
				Sand dropseed	5
761D:					
Hedoes	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
761D: (cont.)					
Belain	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,200	Bluebunch wheatgrass	30
		Normal	1,800	Rough fescue	20
		Unfavorable	1,400	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
761F:					
Hedoes	Silty, Steep, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,000	Rough fescue	60
		Normal	1,700	Idaho fescue	10
		Unfavorable	1,200	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5
Belain	Silty, Steep, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,000	Rough fescue	60
		Normal	1,600	Idaho fescue	10
		Unfavorable	1,200	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5
791C:					
Yamacall	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,400	Bluebunch wheatgrass	30
		Normal	1,200	Western wheatgrass	25
		Unfavorable	900	Green needlegrass	20
				Needleandthread	15
Hillon	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
795C:					
Yamacall	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5
Benz	Saline Upland, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	500	Western wheatgrass	40
		Normal	300	Alkali sacaton	15
		Unfavorable	200	Inland saltgrass	15
				Nuttall saltbush	5
				Greasewood	5
				Basin wildrye	5
799C:					
Yamacall	Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Western wheatgrass	30
		Normal	1,300	Green needlegrass	30
		Unfavorable	900	Bluebunch wheatgrass	20
				Big sagebrush	5
				Winterfat	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
801B:					
Williams	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Vida	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
801C:					
Williams	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Vida	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,500	Bluebunch wheatgrass	30
		Normal	2,000	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
812A:					
Glendive	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,900	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
831A:					
Straw	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,600	Bluebunch wheatgrass	30
		Normal	2,200	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Korchea	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,600	Bluebunch wheatgrass	30
		Normal	2,200	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
833A:					
Enbar	Subirrigated, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	5,500	Northern reedgrass	20
		Normal	5,000	Prairie cordgrass	20
		Unfavorable	4,000	Tufted hairgrass	10
				Slender wheatgrass	10
				Western wheatgrass	5
				Sedge	5
				American mannagrass	5
Straw	Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,600	Bluebunch wheatgrass	30
		Normal	2,200	Rough fescue	20
		Unfavorable	1,500	Idaho fescue	10
				Western wheatgrass	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
Eagleton	Subirrigated, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	6,000	Northern reedgrass	20
		Normal	5,000	Prairie cordgrass	20
		Unfavorable	4,000	Tufted hairgrass	10
				Slender wheatgrass	10
				Western wheatgrass	5
				Sedge	5
				American mannagrass	5
842A:					
Bullhook	Saline Upland, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	250	Western wheatgrass	40
		Normal	175	Alkali sacaton	15
		Unfavorable	100	Inland saltgrass	15
				Nuttall saltbush	5
				Greasewood	5
				Basin wildrye	5
Nobe	Saline Upland, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,100	Western wheatgrass	40
		Normal	900	Alkali sacaton	15
		Unfavorable	700	Inland saltgrass	15
				Nuttall saltbush	5
				Greasewood	5
				Basin wildrye	5
883F:					
Perma	Silty, Steep, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,200	Rough fescue	60
		Normal	1,800	Idaho fescue	10
		Unfavorable	1,500	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5
Whitlash	Shallow, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Idaho fescue	20
		Unfavorable	1,200	Rough fescue	15
				Western wheatgrass	10
				Green needlegrass	10

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
892F:					
Whitlash	Shallow, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,500	Bluebunch wheatgrass	30
		Normal	1,100	Idaho fescue	20
		Unfavorable	800	Rough fescue	15
				Western wheatgrass	10
				Green needlegrass	10
Belain	Silty, Steep, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,000	Rough fescue	60
		Normal	1,600	Idaho fescue	10
		Unfavorable	1,200	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5
895F:					
Whitlash	Shallow, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Idaho fescue	20
		Unfavorable	1,200	Rough fescue	15
				Western wheatgrass	10
				Green needlegrass	10
Perma	Silty, Steep, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,200	Rough fescue	60
		Normal	1,800	Idaho fescue	10
		Unfavorable	1,500	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5
896F:					
Perma	Silty, Steep, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,200	Rough fescue	60
		Normal	1,800	Idaho fescue	10
		Unfavorable	1,500	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5
899F:					
Zahill	Thin Silty, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,900	Bluebunch wheatgrass	35
		Normal	1,500	Rough fescue	20
		Unfavorable	1,100	Idaho fescue	10
				Columbia needlegrass	5
				Green needlegrass	5
				Needleandthread	5
911F:					
Belain	Silty, Steep, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,000	Rough fescue	60
		Normal	1,600	Idaho fescue	10
		Unfavorable	1,200	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5
Hedoes	Silty, Steep, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,000	Rough fescue	60
		Normal	1,700	Idaho fescue	10
		Unfavorable	1,200	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
915F:					
Belain	Silty, Steep, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,000	Rough fescue	60
		Normal	1,600	Idaho fescue	10
		Unfavorable	1,200	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5
Whitlash	Shallow, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,500	Idaho fescue	20
		Unfavorable	1,200	Rough fescue	15
				Western wheatgrass	10
				Green needlegrass	10
Hedoes	Silty, Steep, 15-19" Ppt Zone, Northern Rocky Mountain Foothills, Central	Favorable	2,000	Rough fescue	60
		Normal	1,700	Idaho fescue	10
		Unfavorable	1,200	Columbia needlegrass	10
				Creeping juniper	5
				Common snowberry	5
				Mountain brome	5
951B:					
Kenilworth	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
Fortbenton	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
962B:					
Fortbenton	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass	30
		Normal	1,400	Western wheatgrass	25
		Unfavorable	1,000	Green needlegrass	20
				Needleandthread	15
965B:					
Fortbenton	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
Chinook	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10
968C:					
Fortbenton	Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed	35
		Normal	1,500	Needleandthread	20
		Unfavorable	1,000	Bluebunch wheatgrass	15
				Western wheatgrass	10
				Indian ricegrass	10

Rangeland Productivity and Characteristic Plant Communities--Continued

(Only the soils that support rangeland vegetation suitable for grazing are listed. "Ppt" means precipitation.)

Map symbol and soil name	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
968C: (cont.)					
Hillon----------	Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,800	Bluebunch wheatgrass------------	30
		Normal	1,500	Western wheatgrass--------------	25
		Unfavorable	1,000	Green needlegrass---------------	20
				Needleandthread-----------------	15
968D:					
Hillon----------	Thin Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,450	Bluebunch wheatgrass------------	30
		Normal	1,200	Western wheatgrass--------------	25
		Unfavorable	850	Green needlegrass---------------	20
				Needleandthread-----------------	15
Fortbenton------	Thin Sandy, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	2,000	Prairie sandreed----------------	35
		Normal	1,500	Needleandthread-----------------	20
		Unfavorable	1,000	Bluebunch wheatgrass------------	15
				Western wheatgrass--------------	10
				Indian ricegrass----------------	10
971F:					
Neldore---------	Shallow Clay, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	700	Bluebunch wheatgrass------------	50
		Normal	500	Western wheatgrass--------------	20
		Unfavorable	300	Needleandthread-----------------	15
				Plains muhly--------------------	5
Bascovy---------	Thin Clayey, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,450	Bluebunch wheatgrass------------	30
		Normal	1,200	Western wheatgrass--------------	15
		Unfavorable	850	Green needlegrass---------------	15
				Plains muhly--------------------	5
974F:					
Neldore---------	Shallow Clay, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	700	Bluebunch wheatgrass------------	50
		Normal	500	Western wheatgrass--------------	20
		Unfavorable	300	Needleandthread-----------------	15
				Plains muhly--------------------	5
Hillon----------	Thin Silty, 10-14" Ppt Zone, Glaciated Plains, North	Favorable	1,450	Bluebunch wheatgrass------------	35
		Normal	1,200	Western wheatgrass--------------	20
		Unfavorable	850	Needleandthread-----------------	15
				Green needlegrass---------------	10
				Plains muhly--------------------	5

Understory Vegetation

(Absence of an entry indicates that data were not available)

Map symbol and soil name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
		Lb/acre		Pct
182F:				
Garlet	Favorable	500	Pinegrass	25
	Normal	400	Dwarf huckleberry	10
	Unfavorable	300	Arnica	5
			Blue huckleberry	5
			Bunchberry dogwood	5
			Myrtle whortleberry	5
			Twinflower	5
			White spirea	5
Elkner	Favorable	500	Pinegrass	25
	Normal	400	Bunchberry dogwood	10
	Unfavorable	300	Dwarf huckleberry	10
			Blue huckleberry	5
			Common snowberry	5
			Heartleaf arnica	5
			Russet buffaloberry	5
			White spirea	5
			Twinflower	2
191F:				
Winkler	Favorable	600	Pinegrass	20
	Normal	450	White spirea	15
	Unfavorable	300	Common snowberry	10
			Roughleaf ricegrass	5
			Heartleaf arnica	2
Ambrant	Favorable	600	Pinegrass	30
	Normal	450	Common snowberry	15
	Unfavorable	300	White spirea	10
			Heartleaf arnica	5
			Woods rose	5
			Northern bedstraw	2
			Western meadowrue	2
			Currant	1
			Vetch	1
Winkler, dry	Favorable	400	Bluebunch wheatgrass	25
	Normal	300	Arrowleaf balsamroot	15
	Unfavorable	200	Elk sedge	15
			White spirea	15
			Rough fescue	10
			Common snowberry	5
			Idaho fescue	5
			Pinegrass	5
			Roughleaf ricegrass	5
			Heartleaf arnica	2
			Kinnikinnick	2
			Saskatoon serviceberry	2

Understory Vegetation--Continued

(Absence of an entry indicates that data were not available)

Map symbol and soil name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
		Lb/acre		Pct
241A:				
Hanly	Favorable	2,500	Bluebunch wheatgrass	25
	Normal	2,000	Needleandthread	15
	Unfavorable	1,500	Western wheatgrass	15
			Green needlegrass	10
			Canada wildrye	5
			Common snowberry	5
			Slender wheatgrass	5
			Unnamed perennial forbs	5
530F:				
Warwood	Favorable	500	Pinegrass	40
	Normal	400	Dwarf huckleberry	10
	Unfavorable	300	Bunchberry dogwood	5
			White spirea	5
			Kinnikinnick	2
			Rose	2
			Roughleaf ricegrass	2
			Twinflower	2
			Western meadowrue	2
763E:				
Laceycreek	Favorable	450	Common snowberry	20
	Normal	400	Canada wildrye	15
	Unfavorable	300	Woods rose	15
			Red raspberry	10
			Saskatoon serviceberry	5
			Sticky geranium	5
832A:				
Nesda	Favorable	600	Shrubby cinquefoil	25
	Normal	500	Richardson needlegrass	20
	Unfavorable	400	Snowberry	15
			Common chokecherry	5
			Silverberry	5
Nesda	Favorable	1,800	Basin wildrye	25
	Normal	1,500	Green needlegrass	15
	Unfavorable	1,000	Western wheatgrass	15
			Columbia wheatgrass	10
			Sedge	10
			Rough fescue	5
			Slender wheatgrass	5
896F:				
Whitlash	Favorable	1,200	Bluebunch wheatgrass	25
	Normal	900	Rough fescue	20
	Unfavorable	600	Idaho fescue	10
			Unnamed perennial forbs	10
			Unnamed perennial grasses	10
			Common juniper	5
			Lupine	5
			Needleandthread	5
			Rose	5
			Unnamed shrubs	5

Understory Vegetation--Continued

(Absence of an entry indicates that data were not available)

Map symbol and soil name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
		Lb/acre		Pct
911F:				
Whitlash---------	Favorable	1,200	Bluebunch wheatgrass---------	25
	Normal	900	Rough fescue-----------------	20
	Unfavorable	600	Idaho fescue-----------------	10
			Unnamed perennial forbs------	10
			Unnamed perennial grasses----	10
			Common juniper---------------	5
			Lupine-----------------------	5
			Needleandthread--------------	5
			Rose-------------------------	5
			Unnamed shrubs---------------	5

Forest Land

The tables "Forest Land Productivity" and "Forest Land Management" can be used by forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed.

Woodland Ordination System

The table "Forest Land Management" lists the ordination (woodland suitability) symbol for each soil. The ordination system is a nationwide uniform system of labeling soils or groups of soils that are similar in use and management. The primary factors evaluated in the woodland ordination system are productivity of the forest overstory tree species and the principal soil properties resulting in hazards and limitations that affect forest management. There are three parts of the ordination system—class, subclass, and group. The class and subclass are referred to as the ordination symbol.

Ordination Class Symbol

The first element of the ordination symbol is a number that denotes potential productivity in terms of cubic meters of wood per hectare per year for the indicator tree species. The larger the number, the greater the potential productivity. Potential productivity is based on site index and the corresponding culmination of mean annual increment. For example, the number 1 indicates a potential production of 1 cubic meter of wood per hectare per year (14.3 cubic feet per acre per year) and 10 indicates a potential production of 10 cubic meters of wood per hectare per year (143 cubic feet per acre per year).

Indicator species is a species that is common in the area and is generally, but not necessarily, the most productive on the soil. It is the species that determines the ordination class. The table "Forest Land Productivity" shows the productivity for all species where data have been collected.

Site index is determined by taking height measurements and determining the age of selected trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years. This index applies to fully stocked, even-aged, unmanaged stands. The site indexes shown in the table "Forest Land Productivity" are averages based on measurements made at sites that are representative of the soil series. When the site index and forest land productivity of different soils are compared, the values for the same tree species should be compared. The higher the site index number, the more productive the soil for that species. Site index values are used in conjunction with yield tables to determine average annual yields. Indirectly, they are used to determine the productivity class in the ordination class symbol.

Ordination Subclass Symbol

The second element of the ordination symbol, or subclass, is a capital letter that indicates certain soil or physiographic characteristics that contribute to important hazards or limitations to be considered in management. The subclasses are defined as follows:

Subclass X indicates that forest land use and management are limited by stones or rocks.

Subclass W indicates that forest land use and management are significantly limited by excess water, either seasonally or throughout the year. Restricted drainage, a high water table, or flooding can adversely affect either stand development or management.

Subclass T indicates that the root zone has toxic substances. Excessive alkalinity, acidity, sodium salts, or other toxic substances impede the development of desirable species.

Subclass D indicates that forest land use and management are limited by a restricted rooting depth. The rooting depth is restricted by hard bedrock, a hardpan, or other restrictive layers in the soil.

Subclass C indicates that forest land use and management are limited by the kind or amount of clay in the upper part of the soil.

Subclass S indicates that the soil is sandy, has a low available water capacity, and normally has a low content of available plant nutrients. The use of equipment is limited during dry periods.

Subclass F indicates that forest land use and management are limited by a high content of rock fragments that are larger than 2 millimeters and

smaller than 10 inches. This subclass includes flaggy soils.

Subclass R indicates that forest land use and management are limited by excessive slope.

Subclass A indicates that no significant limitations affect forest land use and management.

Forest Land Management and Productivity

Information about the productivity and management of the forested map units in the county is given in the tables "Forest Land Management" and "Forest Land Productivity."

Management Concerns

In the table "Forest Land Management," the soils are rated for the erosion hazard, the equipment limitation, seedling mortality, the windthrow hazard, and plant competition.

The *erosion hazard* is *slight* if the expected soil loss is small; *moderate* if some measures are needed to control erosion during logging and road construction; and *severe* if intensive management or special equipment and methods are needed to prevent excessive soil loss.

The *equipment limitation* is *slight* if the use of equipment is not limited to a particular kind of equipment or time of year; *moderate* if there is a short seasonal limitation or a need for some modification in the management of equipment; and *severe* if there is a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings are for seedlings that are from a good planting stock and that are properly planted during a period of average rainfall. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

The *windthrow hazard* is *slight* if trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate* if some trees are blown down during periods of excessive soil wetness and strong winds; and *severe* if many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Plant competition is *slight* if there is little or no competition from other plants; *moderate* if plant competition is expected to hinder the development of a fully stocked stand of desirable trees; and *severe* if plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

Potential Productivity

The potential productivity of merchantable or *common trees* is expressed as a site index, which is described under the heading "Ordination Class Symbol." Commonly grown trees are those that forest land managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The column *trees that stands are commonly managed for* in the table "Forest Land Productivity" lists trees that are suitable for commercial wood production and that are suited to the soils.

Forest Access Road Limitations and Hazards

The major management concerns affecting the use of the detailed soil map units for forest access roads are listed in the table "Main Forest Access Road Limitations and Hazards." The significance of each limitation or hazard and the criteria used to determine the limitation or hazard are described in this section.

Areas of rock outcrop and *depth to bedrock* can increase the cost of road construction and influence route planning. Constructing the roads is difficult because of the need for rock removal and for additional soil material to provide a suitable road surface.

Boulders increase the cost of road construction and influence route planning. Construction is difficult mainly because of the need for extraction and disposal of the boulders.

Dustiness of the road surface material may cause safety problems and accelerate equipment wear. Dust-abatement measures are needed during dry periods.

The erodibility of the soil material in the roadbed influences the probability of *water erosion* resulting from the channeling of runoff in the roadway. Erosion can result in the sedimentation of streams. It can be controlled by reducing road grades and controlling runoff onto and off of the road surface through the installation of drainage measures.

Flooding in the area where a road is constructed may restrict use, result in damage to the roadway, and result in the sedimentation of waterways. The hazard of flooding can be reduced by installing a drainage system, elevating the roadbed, and using riprap and diversions.

Low soil strength of the soil material used to construct the road surface can result in rutting, in drainage problems, and in poor trafficability during wet periods.

The road should be used only during dry periods or when the surface is frozen. Surfacing with material of suitable strength and installing a drainage system can help to overcome this limitation.

Roadbed material that has a high *shrink-swell potential* shrinks and swells markedly during dry and wet periods. Excessive shrinking and swelling can damage the road surface or other features, such as bridge abutments, culverts, and erosion-control structures.

A steep *slope* results in increased construction and maintenance costs and increased sedimentation because of the large cuts necessary to create an adequate roadbed. Seeding the cut slope to suitable vegetation minimizes sedimentation. Large cuts can increase instability of the slope. Where slumping is a hazard, slope failure can become a significant maintenance and environmental problem. Areas where the slope is steep should not be used as sites for roads.

Slumping causes safety problems and increases maintenance costs. Frequent clearing of slumped soil in the roadbed or rebuilding of the roadway may be needed to keep the road serviceable and drainage systems functioning.

Stones cause problems in maintaining a smooth road surface that has good trafficability. Unless the stones are removed, additions of suitable stone-free material may be needed when the road is surfaced.

Roads built across soils that have a *water table* may require substantial ballast, fabric, internal drainage systems, and other measures that maintain a road surface that has good trafficability. Construction and use of the road only during periods when the water table is not near the surface or when the road is frozen help to maintain trafficability and reduce the potential for site damage.

Following is an explanation of the criteria used to determine the limitations or hazards.

Areas of rock outcrop.—Rock outcrop is a named component of the map unit.

Areas of rubble land.—Rubble land is a named component of the map unit.

Boulders.—The terms describing the texture within a depth of 24 inches include a bouldery modifier, or the soil is a bouldery phase.

Depth to rock.—Hard bedrock is within a depth of 60 inches.

Dustiness.—The surface layer is silt, silt loam, loam, or very fine sandy loam.

Flooding.—The component of the map unit is occasionally flooded or frequently flooded.

Low soil strength.—The component of the map unit has one of the following Unified classifications within the 60-inch profile: ML, CL, MH, CH, OL, PT, or GC.

Shrink-swell potential.—The component of the map unit has a high shrink-swell potential in a layer that is at least 10 inches thick and is within 40 inches of the surface.

Slope.—The upper slope limit is more than 35 percent.

Slumping.—The component of the map unit meets the requirements for low soil strength and has slopes of more than 35 percent.

Stones.—The terms describing the texture within a depth of 24 inches include a very stony or extremely stony modifier, or the soil is a very stony or extremely stony phase.

Water erosion.—The surface K factor multiplied by the upper slope limit is more than 10.

Water table.—The component of the map unit has a water table within a depth of 60 inches.

Forest Land Management and Productivity for Hill County

Approximately 35,000 acres, or 2 percent of the county, is forest land; 24 percent of this amount is considered noncommercial. The commercial forest land is generally of low productivity, producing less than 50 cubic feet per acre per year. The low productive potential of the area, the small acreage in forest land, the young age (generally less than 100 years) of the forests, and the small tree diameters limit the sawtimber volume available. Consequently, limited harvesting of the timber resource has or is occurring. Forest land in the county is protected from fire by the Department of State Lands Division of Forestry, U.S. Forest Service, and local fire districts.

Soils vary in their ability to support the growth of trees. Depth, fertility, texture, and the available water capacity influence tree growth. Elevation, aspect, soils, and climate determine the kinds of trees that can be expected on any site and their growth rate. Forest land soils in Hill County range from shallow to very deep, from nongravelly to extremely gravelly, and from fine-textured to coarse-textured. Because of differences among the soils, as well as differences in climate, topography, and geology, the forest lands vary in composition and productivity.

The majority of coniferous forest land is along the Bearpaw Mountains, which are in the southeastern part of the county. Elevation ranges from about 3,500 feet to 6,900 feet.

The cover type comprising the largest acreage amount is Ponderosa pine. Cover types of Douglas-fir, lodgepole pine, black cottonwood, narrowleaf cottonwood, plains cottonwood, and quaking aspen cover lesser acreages (Baker, 1925).

Plains cottonwood is at lower elevations along the Milk River drainageway, at elevations of 2,450 to 2,550 feet. Cottonwood is associated with the Hanly soil series. Hanly soils are very deep and somewhat excessively drained.

Black cottonwood and narrowleaf cottonwood are mainly in the southeastern part of the county. They are adjacent to Beaver Creek, near the Bearpaw Mountains, and along other small drainages in the county. Cottonwoods are associated with the Straw and Nesda soil series that developed in recent alluvium. Elevation ranges from 3,900 to 4,400 feet. Straw soils are very deep and loamy, and Nesda soils are very deep with extremely gravelly, loamy sand material near the surface.

The occasionally flooded phases of the Hanly, Straw, and Nesda soils are generally in forest land. Shrubs predominate in the understory. Rarely flooded phases of these series are occasionally in forest land. Trees have been cleared from much of the rarely flooded and some of the occasionally flooded alluvial soil areas.

On the uplands, mainly in the southeastern parts of the county, stands of ponderosa pine exist. They are associated with the Whitlash, Belain, Hedoes, and Perma soil series. Belain, Hedoes, and Perma soils are range components, and Whitlash is the forest land understory component. Elevation ranges from 3,000 to 5,800 feet. Whitlash are shallow soils over igneous bedrock, in the 15- to 19-inch precipitation zone. The understory plant community is dominated by Idaho fescue.

Douglas-fir and ponderosa pine overstories are also in southeastern parts of the county. These forest lands are mainly in the 17- to 20-inch precipitation zone and are on south and west aspects. They are associated with the Winkler and Ambrant soil series. Winkler soils are deep and very gravelly to extremely gravelly, and Ambrant soils are sandy loam soils over a very gravelly substratum. Elevation ranges from 4,000 feet to 6,400 feet. Douglas-fir is the forest land cover type, with an understory plant community consisting primarily of snowberry.

In the southeastern part of the county there are Douglas-fir and lodgepole pine overstories. These forest lands are mainly on north and east aspects in the 20- to 22-inch precipitation zone. The overstories are associated with the Garlet, Elkner, and Warwood soil series. These soils are deep and productive; are on the cooler aspects; and have elevations between 4,400 and 6,900 feet. Douglas-fir is the primary cover type with an understory consisting mainly of dwarf huckleberry.

Quaking aspen are located with ponderosa pine and Douglas-fir cover types in the southeastern parts of the county. They are on elevations of 3,800 to 5,000 feet, and are associated with the Laceycreek soil series. Laceycreek soils are deep with moderate to high available water capacity, located in positions recieving extra moisture as run-in or subirrigation. Quaking aspen are most frequently in the 15- to 19-inch precipitation zone. Douglas-fir is the primary cover type, with an understory plant community comprised mainly of snowberry.

Soil interpretations relating to forest land use and management have been developed to aid those managing forest land in the county. Items considered for interpretation are site index, erosion hazard, equipment limitations, plant competition, seedling mortality, windthrow hazard, species suitability and yield, and kinds and amounts of understory plants.

As interpreted in this survey, the above criteria apply to planting stock one or two years of age with the evaluation period beginning at the time of planting. For natural regeneration the evaluation period was considered to begin a year after germination.

Ratings of windthrow hazard consider soil characteristics affecting the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that normally no trees are blown down by the wind. A rating of *moderate* indicates that an occasional tree may blow down during periods of soil wetness, and moderate or strong winds. A rating of *severe* indicates that many trees may be expected to blow down during periods of excessive soil wetness, with moderate or strong winds.

Soils on north slopes remaining moist into the spring, those having a high water table of 20 to 30 inches, and stands with a high basal area that limits root development were all considered moderately prone to windthrow, even though the soil materials provided a good anchoring medium for tree roots. On drier sites, clayey soils without rock fragments were also considered in this category. Soils having a high water table (within 20 inches of the surface) long enough to inhibit root development were considered to be severly susceptible to windthrow.

Ratings of plant competition indicate the degree to which understory plants are expected to encroach and

affect the establishment of tree seedlings, on different kinds of soil, when openings are made in the canopy.

When making ratings for plant competition, if adequate regeneration usually occurs on a soil within 5 years, the limitation was considered slight, indicating little or no competition from other plants. A moderate rating indicates that plant competition is expected to hinder the development of a fully stocked desirable stand, unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

Listed in the Forest Land Productivity table are the categories "common trees" and "site index." Common trees refers to trees most commonly encountered on the different soils. For the most common trees, particularly those of commercial value, site index values have been determined. Site index is a value ranking soil productivity for a specified tree species. It is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The specified number of years (base age) may be different for different species. The site index applies to fully stocked, even-aged, unmanaged stands of trees. The site index base age is 30 years for narrowleaf cottonwood and plains cottonwood; 50 years for black cottonwood (Sauerwin, 1979) and Douglas-fir (Brickell, 1966); 80 years for quaking aspen (Baker, 1925); and 100 years for lodgepole (Alexander, 1966) and ponderosa pine (Meyer, 1938). Therefore site index values are not directly comparable from one species to another. Locally adapted site index curves developed by the Natural Resources Conservation Service were used for narrowleaf cottonwood and plains cottonwood.

Productivity class, under the heading "Potential productivity," corresponds to the productivity class in the ordination symbol. Productivity class was listed for the more important species, for which soil site correlation data are available.

For the purpose of this survey, average annual yield volumes were computed at the culmination of mean annual increment. Board-foot values in the reference are based on Scribner's log rule and includes all trees larger than 10-inches in diameter breast height, to an 8-inch top diameter inside bark (Dahms, 1964). Total cubic-foot volume estimates are based on all trees being more than a 4-inch diameter breast height.

Forest Land Management

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that data were not available)

Map symbol and soil name	Ordi- nation symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition
182F:						
Garlet	4R	Severe	Severe	Moderate	Slight	Moderate
Elkner	5R	Severe	Severe	Slight	Slight	Moderate
191F:						
Winkler	4R	Severe	Severe	Severe	Slight	Severe
Ambrant	5R	Severe	Severe	Moderate	Slight	Severe
Winkler, dry	4R	Severe	Severe	Severe	Slight	Moderate
241A:						
Hanly	3A	Slight	Slight	Moderate	Slight	Moderate
530F:						
Warwood	5R	Severe	Severe	Slight	Moderate	Moderate
763E:						
Laceycreek	3A	Moderate	Moderate	Slight	Slight	Moderate
832A:						
Nesda	1W	Moderate	Slight	Severe	Slight	Severe
Nesda	1W	Moderate	Slight	Severe	Slight	Severe
896F:						
Whitlash	2R	Severe	Severe	Severe	Severe	Severe
911F:						
Whitlash	2R	Severe	Severe	Severe	Severe	Severe

Forest Land Productivity

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that data were not available)

Map symbol and soil name	Common trees	Site index	Productivity class	Board feet	Cubic feet	Trees that stands are commonly managed for--
182F:						
Garlet	Lodgepole pine	73	4	243	62	Lodgepole pine,
	Douglas-fir	45	4	196	60	Douglas-fir
Elkner	Douglas-fir	49	5	223	67	Lodgepole pine,
	Lodgepole pine	76	5	267	65	Douglas-fir
191F:						
Winkler	Douglas-fir	45	4	196	60	Ponderosa pine,
	Ponderosa pine	73	4	193	59	Douglas-fir
Ambrant	Douglas-fir	51	5	237	71	Ponderosa pine,
	Ponderosa pine	81	5	239	70	Douglas-fir
Winkler, dry	Douglas-fir	40	4	160	52	Ponderosa pine,
	Ponderosa pine	67	4	162	52	Douglas-fir
241A:						
Hanly	Plains cottonwood	65	3	---	---	Plains cottonwood
530F:						
Warwood	Lodgepole pine	77	5	275	66	Lodgepole pine,
	Douglas-fir	48	5	216	65	Douglas-fir
763E:						
Laceycreek	Quaking aspen	61	3	---	---	Douglas-fir
832A:						
Nesda	Black cottonwood	25	1	---	---	Narrowleaf cottonwood,
	Narrowleaf cottonwood	25	1	---	---	black cottonwood
Nesda	Black cottonwood	25	1	---	---	Narrowleaf cottonwood,
	Narrowleaf cottonwood	25	1	---	---	black cottonwood
896F:						
Whitlash	Ponderosa pine	47	2	79	35	Ponderosa pine
911F:						
Whitlash	Ponderosa pine	47	2	79	35	Ponderosa pine

Main Forest Access Road Limitations And Hazards

(Only map units containing a forested component are listed. See text for a description and criteria of the limitations and hazards listed in this table)

Soil name and map symbol	Forest access road limitations or hazards
182F:	
Garlet	Low soil strength Slope Water erosion
Elkner	Slope Water erosion
191F:	
Winkler	Slope
Ambrant	Slope Water erosion
Winkler, dry	Slope
241A:	
Hanly	Flooding
530F:	
Warwood	Low soil strength Slope Water erosion
763E:	
Laceycreek	Low soil strength
832A:	
Nesda	Flooding
Nesda	None
896F:	
Perma	Areas of rock outcrop Low soil strength Slope Water erosion
Whitlash	Areas of rock outcrop Depth to rock Low soil strength Slope Water erosion
Rock outcrop	Nonsoil material

Main Forest Access Road Limitations And Hazards--Continued

(Only map units containing a forested component are listed. See text for a description and criteria of the limitations and hazards listed in this table)

Soil name and map symbol	Forest access road limitations or hazards
911F:	
Belain	Depth to rock Low soil strength Slope Water erosion
Whitlash	Depth to rock Low soil strength Slope Water erosion
Hedoes	Low soil strength Water erosion

Recreation

The soils of the county are rated in the table "Recreational Development" according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The soils are rated on the basis of soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an adequate cover of vegetation. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on the basis of soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use. The degree of soil limitation is expressed as *slight*, *moderate*, or *severe*.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated *slight*.

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope,

bedrock near the surface, flooding, and a seasonal high water table. These limitations generally require major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly.

The information in the table “Recreational Development” can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in the table “Building Site Development” and interpretations for septic tank absorption fields in the table “Sanitary Facilities.”

Recreation in Hill County

Hill County contains Beaver Creek Park, the Fresno Reservoir, and the Bear Paw Ski Bowl. Beaver Creek Park is located 10 miles south of Havre, Fresno Reservoir is 15 miles northwest of Havre, and the Bear Paw Ski Bowl is south of Havre in the Bear Paw Mountains. These three sites provide numerous recreational opportunities for the people of north-central Montana.

Created in 1916, Beaver Creek Park is the largest county park in the United States. It is 1 mile wide and 17 miles long, and is adjacent to Beaver Creek in the Bear Paw Mountains. After this land was part of the original Fort Assiniboine Military Reservation, four of Havre’s early businessmen filed mining claims on it and later donated the land as a playground for people of the area, with Havre designated as the custodian. In 1947, Hill County purchased the park. Many of the cultural features in the park were built by the Civilian Conservation Corps in the 1930s. Many local groups have contributed to improvement of the park over the years.

Beaver Creek Park has two man-made lakes, the Bearpaw Lake and Lower Lake. Fishing, swimming, picnicking, and camping are enjoyed by park visitors. There are numerous hiking and horseback riding trails which serve as cross-country ski trails in the winter.

Fresno Reservoir was built in the 1930’s for irrigation purposes. Six Hi-line towns depend on this lake for their water supply. The lake also contributes excellent fishing, swimming, picnicking, and camping opportunities.

Recreational Development

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
13A: McKenzie	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey, excess salt.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: excess salt, wetness, too clayey.
16B: Degrand	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Moderate: droughty.
22E: Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
22F: Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
24A: Hanly	Severe: flooding.	Slight	Slight	Slight	Moderate: droughty.
27B: Attewan	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
28A: Nishon	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
30A: Marvan	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
30C: Marvan	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
31A: Ferd	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
32A: Kobase	Slight	Slight	Slight	Slight	Slight.
33A: Phillips	Moderate: dusty.	Moderate: dusty.	Moderate: small stones, dusty.	Moderate: dusty.	Slight.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
34A:					
Dimmick---------	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
36A:					
Chinook---------	Slight-----------	Slight-----------	Moderate: small stones.	Slight-----------	Slight.
36C:					
Chinook---------	Slight-----------	Slight-----------	Moderate: slope, small stones.	Slight-----------	Slight.
37A:					
Evanston--------	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
51A:					
Wheatbelt-------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too clayey.
53D:					
Beaverton-------	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight-----------	Moderate: small stones, large stones, droughty.
55A:					
Benz------------	Moderate: excess salt.	Moderate: excess salt.	Moderate: excess salt.	Slight-----------	Moderate: excess salt, droughty.
60A:					
Havre-----------	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
62C:					
Weingart--------	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight-----------	Severe: excess sodium.
Weingart, thin surface--------	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: too clayey.	Severe: excess sodium, too clayey.
72F:					
Zahill----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
74B:					
Marias----------	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
75B:					
Farnuf	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
75C:					
Farnuf	Slight	Slight	Severe: slope.	Slight	Slight.
76B:					
Bowery	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
76C:					
Bowery	Slight	Slight	Severe: slope.	Slight	Slight.
76D:					
Bowery	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
78A:					
Lostriver	Severe: flooding.	Moderate: too clayey, excess salt.	Moderate: too clayey, excess salt.	Moderate: too clayey.	Severe: too clayey.
79B:					
Yamacall	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
81A:					
Glendive	Severe: flooding.	Slight	Slight	Slight	Slight.
84A:					
Bullhook	Severe: flooding.	Moderate: excess salt.	Moderate: excess salt.	Slight	Moderate: excess salt.
90A:					
Harlake	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
92B:					
Marmarth	Moderate: dusty.	Moderate: dusty.	Moderate: slope, depth to rock, dusty.	Moderate: dusty.	Moderate: depth to rock.
93D:					
Tally	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
96B:					
Fortbenton	Slight	Slight	Moderate: slope.	Slight	Slight.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
96C:					
Fortbenton	Slight	Slight	Severe: slope.	Slight	Slight.
98B:					
Kremlin	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
99A:					
Thibadeau	Severe: flooding, excess salt.	Severe: excess salt.	Severe: excess salt.	Slight	Severe: excess salt.
110D:					
Laceycreek	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
115B:					
Thoeny	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: dusty.	Severe: excess sodium.
Elloam	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
171C:					
Delpoint	Moderate: dusty.	Moderate: dusty.	Moderate: slope, depth to rock, dusty.	Moderate: dusty.	Moderate: depth to rock.
Cabbart	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: dusty.	Severe: depth to rock.
172C:					
Delpoint, calcareous	Moderate: dusty.	Moderate: dusty.	Moderate: slope, depth to rock, dusty.	Moderate: dusty.	Moderate: depth to rock.
Delpoint	Moderate: dusty.	Moderate: dusty.	Moderate: slope, depth to rock, dusty.	Moderate: dusty.	Moderate: depth to rock.
182F:					
Garlet	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.
Elkner	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
191F:					
Winkler	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
191F: (cont.)					
Ambrant	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
200F:					
Badland.					
203F:					
Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, depth to rock.
Rock outcrop.					
204F:					
Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, depth to rock.
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
205F:					
Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, depth to rock.
Macar	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
211F:					
Cabbart	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, depth to rock.
Rock outcrop.					
212F:					
Cabbart	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, depth to rock.
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
213E:					
Cabbart	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: slope, depth to rock.
Yawdim	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: too clayey, slope.	Severe: slope, depth to rock, too clayey.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
221D:					
Hillon	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Kevin	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
224D:					
Hillon	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Joplin	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
241A:					
Hanly	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: droughty, flooding.
251D:					
Bascovy	Moderate: slope, percs slowly, too clayey.	Moderate: slope, too clayey, percs slowly.	Severe: slope.	Severe: erodes easily.	Severe: too clayey.
Neldore	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Moderate: too clayey.	Severe: droughty, depth to rock, too clayey.
262A:					
Absher	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: too clayey.	Severe: excess sodium, too clayey.
Gerdrum	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
272C:					
Attewan	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Tinsley	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Severe: droughty.
304A:					
Marvan	Moderate: percs slowly, too clayey, excess salt.	Moderate: too clayey, excess salt, percs slowly.	Moderate: too clayey, percs slowly, excess salt.	Moderate: too clayey.	Severe: too clayey.
Nobe	Moderate: percs slowly, too clayey, excess salt.	Moderate: too clayey, excess salt, percs slowly.	Moderate: too clayey, percs slowly, excess salt.	Moderate: too clayey.	Severe: too clayey.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
309A:					
Marvan, saline	Moderate: percs slowly, too clayey, excess salt.	Moderate: too clayey, excess salt, percs slowly.	Moderate: too clayey, percs slowly, excess salt.	Moderate: too clayey.	Severe: too clayey.
Marvan	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
311B:					
Ferd	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
Creed	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: dusty.	Severe: excess sodium.
Gerdrum	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
321A:					
Kobase	Slight	Slight	Slight	Slight	Slight.
331B:					
Phillips	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Elloam	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
334B:					
Phillips	Moderate: dusty.	Moderate: dusty.	Moderate: small stones, dusty.	Moderate: dusty.	Slight.
Kevin	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
362C:					
Chinook	Slight	Slight	Severe: slope.	Slight	Slight.
Yetull	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty.
375B:					
Evanston	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
Lonna	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
381A:					
Ethridge	Slight	Slight	Slight	Slight	Slight.
400F:					
Rubble land.					
Rock outcrop.					
402A:					
Gerdrum	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
Absher	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: too clayey.	Severe: excess sodium, too clayey.
Creed	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: dusty.	Severe: excess sodium.
421C:					
Joplin	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
Hillon	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
441C:					
Kevin	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Hillon	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
442C:					
Kevin	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Elloam	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
501B:					
Telstad	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Hillon	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
503B:					
Telstad	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Joplin	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
503C:					
Telstad	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.	Slight.
Joplin	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.	Slight.
522A:					
Elloam	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
Absher	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: too clayey.	Severe: excess sodium, too clayey.
530F:					
Warwood	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
561B:					
Scobey	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Kevin	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
561C:					
Scobey	Slight	Slight	Severe: slope.	Slight	Slight.
Kevin	Slight	Slight	Severe: slope.	Slight	Slight.
564B:					
Scobey	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Hillon	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
571D:					
Chinook	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
571D: (cont.)					
Cozberg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Yetull	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
573B:					
Cozberg	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Chinook	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
603A:					
Havre	Severe: flooding.	Slight	Slight	Slight	Slight.
Harlake	Severe: flooding.	Slight	Slight	Slight	Slight.
604A:					
Havre	Severe: flooding.	Moderate: dusty.	Moderate: flooding, dusty.	Moderate: dusty.	Moderate: flooding.
Glendive	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
611B:					
Hingham	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
Lonna	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
661C:					
Twilight	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: droughty, depth to rock.
Blacksheep	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: depth to rock.
671B:					
Bearpaw	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Vida	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
671C:					
Bearpaw	Slight	Slight	Severe: slope.	Slight	Slight.
Vida	Slight	Slight	Severe: slope.	Slight	Moderate: large stones.
671D:					
Bearpaw	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Vida	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
674B:					
Bearpaw	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Waltham	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
696C:					
Vida	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
Zahill	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
Bearpaw	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
701D:					
Yetull	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Busby	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
721E:					
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Vida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
722D:					
Zahill	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
722D: (cont.)					
Vida	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
725F:					
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Rock outcrop.					
729F:					
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Obrien	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
732C:					
Yetull	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
Lonesome	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
761D:					
Hedoes	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
Belain	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope, depth to rock.
761F:					
Hedoes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Belain	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
763E:					
Laceycreek	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
791C:					
Yamacall	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Hillon	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
795C:					
Yamacall	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Benz	Moderate: excess salt.	Moderate: excess salt.	Moderate: slope, excess salt.	Slight	Moderate: excess salt, droughty.
799C:					
Yamacall	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
801B:					
Williams	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Vida	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
801C:					
Williams	Slight	Slight	Severe: slope.	Slight	Slight.
Vida	Slight	Slight	Severe: slope.	Slight	Moderate: large stones.
812A:					
Glendive	Severe: flooding.	Slight	Slight	Slight	Slight.
831A:					
Straw	Severe: flooding.	Slight	Slight	Slight	Slight.
Korchea	Severe: flooding.	Slight	Slight	Slight	Slight.
832A:					
Nesda	Severe: flooding, small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones, droughty.
Nesda	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, droughty.
833A:					
Enbar	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: flooding.
Straw	Severe: flooding.	Slight	Slight	Slight	Slight.
Eagleton	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
842A:					
Bullhook	Severe: flooding.	Moderate: excess salt.	Moderate: excess salt.	Slight	Moderate: excess salt.
Nobe	Severe: flooding.	Moderate: too clayey, excess salt, percs slowly.	Moderate: too clayey, percs slowly, excess salt.	Moderate: too clayey.	Severe: too clayey.
883F:					
Perma	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.
Whitlash	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: droughty, slope, depth to rock.
892F:					
Whitlash	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: droughty, slope, depth to rock.
Belain	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Rock outcrop.					
895F:					
Whitlash	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Perma	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Rock outcrop.					
896F:					
Perma	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Whitlash	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop.					
899F:					
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
899F: (cont.)					
Rock outcrop.					
Whitlash	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
911F:					
Belain	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Whitlash	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Hedoes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
915F:					
Belain	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Whitlash	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Hedoes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
951B:					
Kenilworth	Slight	Slight	Moderate: slope.	Slight	Slight.
Fortbenton	Slight	Slight	Moderate: slope.	Slight	Slight.
962B:					
Fortbenton	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
965B:					
Fortbenton	Slight	Slight	Moderate: slope.	Slight	Slight.
Chinook	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
968C:					
Fortbenton	Slight	Slight	Moderate: slope.	Slight	Slight.
Hillon	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.

Recreational Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
968D:					
Hillon----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Fortbenton------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
971F:					
Neldore---------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: droughty, slope, depth to rock.
Bascovy---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope, too clayey.
974F:					
Neldore---------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to roc.	Severe: slope.	Severe: droughty, slope, depth to rock.
Hillon----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
DA: Denied access.					
M-W: Miscellaneous water.					
W: Water.					

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. If food, cover, or water is missing, inadequate, or inaccessible, wildlife will be scarce or will not inhabit the area.

If the soils have potential for habitat development, wildlife habitat can be created or improved by planting appropriate vegetation, properly managing the existing plant cover, and fostering the natural establishment of desirable plants.

Elements of Wildlife Habitat

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants used by wildlife. Examples are wheat, rye, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife food and cover. Examples are fescue, bromegrass, timothy, orchardgrass, clover, alfalfa, trefoil, reed canarygrass, and crownvetch.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestem, indiangrass, blueberry, goldenrod, lambsquarters, dandelions, blackberry, ragweed, wheatgrass, fescue, and nightshade.

The major soil properties affecting the growth of grain and forage crops and wild herbaceous plants are depth of the root zone, texture of the surface layer, the amount of water available to plants, wetness, salinity or sodicity, and flooding. The length of the growing season also is important.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage that wildlife eat. Examples are oak, poplar, boxelder, birch, maple, green ash, willow, and American elm. Examples of fruit-producing shrubs are hawthorn, honeysuckle, American plum, redosier dogwood, chokecherry, serviceberry, silver buffaloberry, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover that provide habitat or supply food in the form of browse, seed, or fruitlike cones. Examples are pine, spruce, hemlock, fir, yew, cedar, larch, and juniper.

The major soil properties affecting the growth of hardwood and coniferous trees and shrubs are the depth of the root zone, the amount of water available to plants, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Wetland plants produce food or cover for wetland wildlife. Examples of these plants are smartweed, wild millet, rushes, sedges, bulrushes, wild rice, arrowhead, waterplantain, pickerelweed, and cattail.

The major soil properties affecting wetland plants are texture of the surface layer, wetness, acidity or alkalinity, and slope.

Shallow water areas have an average depth of less than 5 feet. They are useful as habitat for some wildlife species. They are naturally wet areas or are created by dams, levees, or water-control measures in marshes or streams. Examples are muskrat marshes, waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife ponds.

The major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability.

Kinds of Wildlife Habitat

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include Hungarian partridge, pheasant, sharp-tailed grouse, sage grouse, meadowlark, field sparrow, killdeer, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of hardwoods or conifers or a mixture of these and associated grasses, legumes, and wild herbaceous plants. The wildlife attracted to this habitat include wild

turkey, ruffed grouse, thrushes, woodpeckers, owls, tree squirrels, porcupine, raccoon, deer, elk, and black bear.

Habitat for wetland wildlife consists of open, marshy or swampy, shallow water areas that support water-tolerant plants. The wildlife attracted to this habitat include ducks, geese, herons, bitterns, rails, kingfishers, muskrat, otter, mink, and beaver.

Habitat for range wildlife consists of areas of shrubs and wild herbaceous plants. The wildlife attracted to these areas include antelope, deer, sage grouse, meadowlark, and lark bunting.

Wildlife of Hill County

A variety of habitat are available for wildlife in Hill County. It contains native grassland, nonirrigated and irrigated cropland, introduced grasses, coniferous forests, riparian woodlands, streams, rivers, ponds, marshes, and reservoirs.

Irrigated and nonirrigated farming aided in the introduction of ring-necked pheasant, particularly on the bottom lands of the Milk River and its major tributaries, the Beaver, Box Elder, Bullhook, Lodge, and Big Sage Creeks. The success of this introduction was the result of varied land use patterns including small grain, irrigated crops, annual weeds, and brushy cover. Pheasant populations, however, are limited by the very farming practices that fostered them. In recent years more intensive farming has resulted in fewer idle areas and the loss of brushy fence rows and densely vegetated ditchbanks. This has been detrimental to the number of pheasants in the county.

Land management practices beneficial to pheasants include proper grazing, protection of woody cover from burning or eradication, retention of stubble and waste grain during the winter months by eliminating fall tillage, and the use of woody plantings such as shelterbelts and hedgerows.

Sharp-tailed grouse are found throughout many of the prairie uplands of the county. Grainfields, brushy cover, and fruit-bearing shrubs such as Russian olive, chokecherry, plum, rose, snowberry, and buffaloberry provide for excellent habitat.

Hungarian partridge, a species introduced from Europe, is associated with the cropland and grassland in the county. Like the sharp-tailed grouse, populations of Hungarian partridge fluctuate due to changes in available habitat, variability of weather, and disease. They often congregate around shelterbelts and farmsteads for their food and cover, especially during the winter months.

Land management practices that are beneficial to Hungarian partridge and to the sharp-tailed grouse include proper grazing to maintain sufficient vegetation for nesting, roosting, and rearing of young; and the protection of woody vegetation in draws and along fence rows.

Sage grouse are in areas of range in the northeast corner of the county. Optimum sage grouse habitat are plant communities of sagebrush, with a variety of forbs and grasses.

The Milk River, its tributaries, and the many marshes, potholes, and reservoirs throughout the county provide habitat for an abundance of waterfowl during spring and fall migrations. Migratory birds use riverine habitat for nesting, feeding, and loafing. Substantial populations of Canada geese use the Milk River and Fresno Reservoir throughout the year. Geese nest on the water's larger islands, shorelines, and banks. They use the sparsely vegetated sandbars as loafing and feeding areas. Areas of cropland adjacent to rivers and streams provide important feeding areas for migratory waterfowl.

Both white-tailed deer and mule deer inhabit the county. White-tailed deer generally exist along the flood plain of the Milk River and its tributaries. Mule deer are in many areas on the uplands and brushy bottoms, and in some areas of range. The largest populations of mule deer are along the breaks of Milk River and its tributaries, and in the Bear Paw Mountains.

Pronghorn antelope are mainly on prairies in the northeastern corner of the county, though a few scattered bands are observed throughout the rest of the county.

The potential for maintaining pronghorn antelope herds is dependent on the proper management of rangeland and the existence of water.

Rocky Mountain elk are in the Bear Paw Mountains in the southeastern corner of the county. Habitat where elk are generally located is the timbered area of mountains and meadows. Elk were once animals of the plains and are found occasionally on native range and rugged breaks and canyons.

Beaver, mink, muskrat, and raccoon are located along main watercourses. Cottontail rabbits, badgers, ground squirrels, coyotes, red fox, and a variety of small mammals and song birds are spread throughout the area.

Populations of game and nongame species can be enhanced through conservation practices that improve or create habitat. Among these are the development of odd or irregularly shaped areas in or adjacent to

farmland, protection of such areas from fire and livestock grazing, and the establishment of woody vegetation to provide shelter during winter. Wildlife habitat may also be enhanced by increasing application of common conservation practices such as proper grazing use, planned grazing systems, stripcropping, conservation tillage systems, field windbreaks, and the construction of ponds.

Beaver Creek, Box Elder Creek, and several small reservoirs in the county support a population of trout and other cold water fish species. Warm water species, such as northern pike, sauger, and walleye, live in the Milk River, Fresno Reservoir, and other small reservoirs. Species such as perch and crappie are also in the Fresno and other small reservoirs. Practices to improve or maintain water quality can enhance and protect these fisheries. These practices include grassed waterways, pesticide and nutrient management, proper grazing of riparian areas, animal waste management, minimizing streambed disturbance, and irrigation water management.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

The table "Building Site Development" shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink- swell potential, potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

The table "Sanitary Facilities" shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. It also shows the suitability of the soils for use as a daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of *slight, moderate,* or *severe* are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of *good, fair,* and *poor* are given for daily cover for landfill.

A rating of *slight* or *good* indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of *moderate* or *fair* indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of *severe* or *poor* indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

Septic tank absorption fields are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be

unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Relatively impervious soil material for the lagoon floor and sides is desirable to minimize seepage and contamination of local ground water.

The table "Sanitary Facilities" gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Trench sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil that is excavated from the trench. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. Soil properties that influence the risk of pollution, the ease of excavation, trafficability, and revegetation are the major considerations in rating the soils.

Area sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2 feet thick is placed over the completed landfill. Soil properties that influence trafficability, revegetation, and the risk of pollution are the main considerations in rating the soils for area sanitary landfills.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. The ratings in the table "Sanitary Facilities" are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The suitability of a soil for use as cover is based on properties that affect workability and the ease of digging, moving, and spreading the material over the refuse daily during both wet and dry periods.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They also are important when the soil is used as a medium for the treatment and disposal of the organic waste and wastewater. Unfavorable soil properties can result in environmental damage.

The use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated

with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area and environmental damage is unlikely.

Interpretations developed for waste management may include ratings for manure- and food-processing waste, municipal sewage sludge, use of wastewater for irrigation, and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes.

Specific information regarding waste management is available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Construction Materials

The table "Construction Materials" gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In the table "Construction Materials," the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, slopes of more than 25 percent, or a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the table "Construction Materials," only the probability of finding material in suitable quantity in or below the soil is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones

and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20- to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

The table "Water Management" gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In the table "Water Management," the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones

and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff.

Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Building Site Development

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
13A:						
McKenzie	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: excess salt, wetness, too clayey.
16B:						
Degrand	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
22E:						
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
22F:						
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
24A:						
Hanly	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
27B:						
Attewan	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
28A:						
Nishon	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
30A:						
Marvan	Severe: cutbanks cave.	Slight	Slight	Slight	Severe: low strength.	Severe: too clayey.
30C:						
Marvan	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Severe: low strength.	Severe: too clayey.
31A:						
Ferd	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
32A:						
Kobase	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Slight.
33A:						
Phillips	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
34A:						
Dimmick	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness, too clayey.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
36A:						
Chinook	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
36C:						
Chinook	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
37A:						
Evanston	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.	Slight.
51A:						
Wheatbelt	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness, too clayey.
53D:						
Beaverton	Severe: cutbanks cave.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, frost action, large stones.	Moderate: small stones, large stones, droughty.
55A:						
Benz	Slight	Slight	Slight	Slight	Moderate: frost action.	Moderate: excess salt, droughty.
60A:						
Havre	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
62C:						
Weingart	Moderate: depth to rock, too clayey.	Slight	Moderate: depth to rock.	Moderate: slope.	Severe: low strength.	Severe: excess sodium.
Weingart, thin surface	Moderate: depth to rock, too clayey.	Slight	Moderate: depth to rock.	Moderate: slope.	Severe: low strength.	Severe: excess sodium, too clayey.
72F:						
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
74B:						
Marias	Severe: cutbanks cave.	Slight	Slight	Slight	Severe: low strength.	Severe: too clayey.
75B:						
Farnuf	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
75C:						
Farnuf	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
76B:						
Bowery	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
76C:						
Bowery	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
76D:						
Bowery	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
78A:						
Lostriver	Moderate: too clayey.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Severe: too clayey.
79B:						
Yamacall	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
81A:						
Glendive	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
84A:						
Bullhook	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, flooding, frost action.	Moderate: excess salt.
90A:						
Harlake	Moderate: too clayey.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Severe: too clayey.
92B:						
Marmarth	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Slight	Moderate: low strength, frost action.	Moderate: depth to rock.
93D:						
Tally	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
96B:						
Fortbenton	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
96C:						
Fortbenton	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
98B:						
Kremlin	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
99A:						
Thibadeau	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: excess salt.
110D:						
Laceycreek	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
115B:						
Thoeny	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium.
Elloam	Moderate: dense layer.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium.
171C:						
Delpoint	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength, frost action.	Moderate: depth to rock.
Cabbart	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Severe: depth to rock.
172C:						
Delpoint, calcareous	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength, frost action.	Moderate: depth to rock.
Delpoint	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength, frost action.	Moderate: depth to rock.
182F:						
Garlet	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Elkner	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
191F:						
Winkler	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Ambrant	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Winkler, dry	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
200F:						
Badland.						

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
203F:						
Cabba-----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop.						
204F:						
Cabba-----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Zahill----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
205F:						
Cabba-----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Macar-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
211F:						
Cabbart---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop.						
212F:						
Cabbart---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Hillon----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
213E:						
Cabbart---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Yawdim----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope, depth to rock, too clayey.
221D:						
Hillon----------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Kevin-----------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
224D:						
Hillon----------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
224D: (cont.)						
Joplin	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
241A:						
Hanly	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
251D:						
Bascovy	Severe: cutbanks cave.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Severe: low strength.	Severe: too clayey.
Neldore	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Severe: droughty, depth to rock, too clayey.
262A:						
Absher	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium, too clayey.
Gerdrum	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium.
272C:						
Attewan	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Tinsley	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: large stones.	Severe: droughty.
304A:						
Marvan	Severe: cutbanks cave.	Slight	Slight	Slight	Severe: low strength.	Severe: too clayey.
Nobe	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Severe: too clayey.
309A:						
Marvan, saline	Severe: cutbanks cave.	Slight	Slight	Slight	Severe: low strength.	Severe: too clayey.
Marvan	Severe: cutbanks cave.	Slight	Slight	Slight	Severe: low strength.	Severe: too clayey.
311B:						
Ferd	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Creed	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium.
Gerdrum	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
321A:						
Kobase	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Slight.
331B:						
Phillips	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Elloam	Moderate: dense layer.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium.
334B:						
Phillips	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Kevin	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
362C:						
Chinook	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Yetull	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
375B:						
Evanston	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.	Slight.
Lonna	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
381A:						
Ethridge	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Slight.
400F:						
Rubble land.						
Rock outcrop.						
402A:						
Gerdrum	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium.
Absher	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium, too clayey.
Creed	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium.
421C:						
Joplin	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Hillon	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
441C:						
Kevin	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
Hillon	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
442C:						
Kevin	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
Elloam	Moderate: dense layer.	Slight	Slight	Moderate: slope.	Severe: low strength.	Severe: excess sodium.
501B:						
Telstad	Slight	Slight	Slight	Slight	Moderate: low strength.	Slight.
Hillon	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
503B:						
Telstad	Slight	Slight	Slight	Slight	Moderate: low strength.	Slight.
Joplin	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
503C:						
Telstad	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
Joplin	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
522A:						
Elloam	Moderate: dense layer.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium.
Absher	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium, too clayey.
530F:						
Warwood	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
561B:						
Scobey	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Kevin	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
561C:						
Scobey	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
Kevin	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
564B:						
Scobey	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Hillon	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
571D:						
Chinook	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Cozberg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
Yetull	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
573B:						
Cozberg	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
Chinook	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
603A:						
Havre	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
Harlake	Moderate: too clayey.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
604A:						
Havre	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Glendive	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
611B:						
Hingham	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
Lonna	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
661C:						
Twilight	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.	Moderate: droughty, depth to rock.
Blacksheep	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Severe: depth to rock.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
671B:						
Bearpaw	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Slight.
Vida	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.	Moderate: large stones
671C:						
Bearpaw	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
Vida	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Moderate: large stones.
671D:						
Bearpaw	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Vida	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: large stones, slope.
674B:						
Bearpaw	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Slight.
Waltham	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Severe: excess sodium.
696C:						
Vida	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Moderate: large stones.
Zahill	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Moderate: large stones.
Bearpaw	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
701D:						
Yetull	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Busby	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
721E:						
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
722D:						
Zahill	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: large stones, slope.
Vida	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: large stones, slope.
725F:						
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
729F:						
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Obrien	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
732C:						
Yetull	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Lonesome	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
761D:						
Hedoes	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
Belain	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Moderate: droughty, slope, depth to rock.
761F:						
Hedoes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Belain	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
763E:						
Laceycreek	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
791C:						
Yamacall	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Hillon	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
795C:						
Yamacall	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Benz	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: excess salt, droughty.
799C:						
Yamacall	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
801B:						
Williams	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
Vida	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.	Moderate: large stones.
801C:						
Williams	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Vida	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Moderate: large stones.
812A:						
Glendive	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
831A:						
Straw	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
Korchea	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
832A:						
Nesda	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: small stones, droughty.
Nesda	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: small stones, droughty.
833A:						
Enbar	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
Straw	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
833A: (cont.)						
Eagleton	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
842A:						
Bullhook	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, flooding, frost action.	Moderate: excess salt.
Nobe	Moderate: too clayey, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Severe: too clayey.
883F:						
Perma	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Whitlash	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: droughty, slope, depth to rock.
892F:						
Whitlash	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: droughty, slope, depth to rock.
Belain	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
895F:						
Whitlash	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Perma	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
896F:						
Perma	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Whitlash	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop.						

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
899F:						
Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
Whitlash	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
911F:						
Belain	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Whitlash	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Hedoes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
915F:						
Belain	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Whitlash	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Hedoes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
951B:						
Kenilworth	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Fortbenton	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
962B:						
Fortbenton	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
965B:						
Fortbenton	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
Chinook	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
968C:						
Fortbenton	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Hillon	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.

Building Site Development--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
968D:						
Hillon----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Fortbenton------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
971F:						
Neldore---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: droughty, slope, depth to rock.
Bascovy---------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope, too clayey.
974F:						
Neldore---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: droughty, slope, depth to rock.
Hillon----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
DA: Denied access.						
M-W: Miscellaneous water.						
W: Water						

Sanitary Facilities

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
13A:					
McKenzie	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
16B:					
Degrand	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
22E:					
Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
22F:					
Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
24A:					
Hanly	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Moderate: flooding.	Poor: seepage, too sandy.
27B:					
Attewan	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy, small stones.
28A:					
Nishon	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
30A:					
Marvan	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
30C:					
Marvan	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
31A:					
Ferd	Severe: percs slowly.	Slight	Slight	Slight	Good.
32A:					
Kobase	Severe: percs slowly.	Slight	Slight	Slight	Good.
33A:					
Phillips	Severe: percs slowly.	Slight	Slight	Slight	Good.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
34A:					
Dimmick	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
36A:					
Chinook	Slight	Severe: seepage.	Slight	Slight	Good.
36C:					
Chinook	Slight	Severe: seepage.	Slight	Slight	Good.
37A:					
Evanston	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
51A:					
Wheatbelt	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
53D:					
Beaverton	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
55A:					
Benz	Severe: percs slowly.	Slight	Slight	Slight	Good.
60A:					
Havre	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
62C:					
Weingart	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock, hard to pack.
Weingart, thin surface	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock, hard to pack.
72F:					
Zahill	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
74B:					
Marias	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
75B:					
Farnuf	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
75C:					
Farnuf	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
76B:					
Bowery	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
76C:					
Bowery	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
76D:					
Bowery	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
78A:					
Lostriver	Severe: percs slowly.	Slight	Moderate: flooding.	Moderate: flooding.	Poor: hard to pack.
79B:					
Yamacall	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Good.
81A:					
Glendive	Moderate: flooding.	Severe: seepage.	Moderate: flooding, too sandy.	Moderate: flooding.	Fair: too sandy.
84A:					
Bullhook	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
90A:					
Harlake	Severe: percs slowly.	Slight	Moderate: flooding.	Moderate: flooding.	Poor: hard to pack.
92B:					
Marmarth	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
93D:					
Tally	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too sandy, slope.
96B:					
Fortbenton	Severe: percs slowly.	Severe: seepage.	Slight	Slight	Good.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
96C:					
Fortbenton	Severe: percs slowly.	Severe: seepage.	Slight	Slight	Good.
98B:					
Kremlin	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
99A:					
Thibadeau	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
110D:					
Laceycreek	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: small stones, slope.
115B:					
Thoeny	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Poor: hard to pack.
Elloam	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
171C:					
Delpoint	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
Cabbart	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
172C:					
Delpoint, calcareous	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
Delpoint	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
182F:					
Garlet	Severe: slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: small stones, slope.
Elkner	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
191F:					
Winkler	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Ambrant	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
191F: (cont.)					
Winkler, dry	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
200F:					
Badland.					
203F:					
Cabba	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Rock outcrop.					
204F:					
Cabba	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Zahill	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
205F:					
Cabba	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Macar	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
211F:					
Cabbart	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Rock outcrop.					
212F:					
Cabbart	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
213E:					
Cabbart	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Yawdim	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
221D:					
Hillon	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Kevin	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
224D:					
Hillon	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Joplin	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
241A:					
Hanly	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, too sandy.	Severe: flooding.	Poor: seepage, too sandy.
251D:					
Bascovy	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Neldore	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock, hard to pack.
262A:					
Absher	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
Gerdrum	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
272C:					
Attewan	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy, small stones.
Tinsley	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy, large stones.	Severe: seepage.	Poor: seepage, too sandy, small stones.
304A:					
Marvan	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Nobe	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
309A:					
Marvan	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
311B:					
Ferd	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Creed	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Gerdrum	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Poor: hard to pack.
321A:					
Kobase	Severe: percs slowly.	Slight	Slight	Slight	Good.
331B:					
Phillips	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Elloam	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
334B:					
Phillips	Severe: percs slowly.	Slight	Slight	Slight	Good.
Kevin	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
362C:					
Chinook	Slight	Severe: seepage.	Slight	Slight	Good.
Yetull	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
375B:					
Evanston	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Lonna	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
381A:					
Ethridge	Severe: percs slowly.	Slight	Slight	Slight	Good.
400F:					
Rubble land.					
Rock outcrop.					
402A:					
Gerdrum	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
Absher	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
402A: (cont.)					
Creed	Severe: percs slowly.	Slight	Slight	Slight	Good.
421C:					
Joplin	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
Hillon	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
441C:					
Kevin	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Hillon	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
442C:					
Kevin	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Elloam	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
501B:					
Telstad	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Hillon	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
503B:					
Telstad	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Joplin	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
503C:					
Telstad	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Joplin	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
522A:					
Elloam	Severe: percs slowly.	Slight	Slight	Slight	Good.
Absher	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
530F:					
Warwood	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
561B:					
Scobey	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Fair: small stones.
Kevin	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
561C:					
Scobey	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Fair: small stones.
Kevin	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
564B:					
Scobey	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Fair: small stones.
Hillon	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
571D:					
Chinook	Moderate: slope.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Cozberg	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: seepage, too sandy.
Yetull	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: seepage, too sandy.
573B:					
Cozberg	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
Chinook	Slight	Severe: seepage.	Slight	Slight	Good.
603A:					
Havre	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
Harlake	Severe: percs slowly.	Slight	Moderate: flooding.	Moderate: flooding.	Poor: hard to pack.
604A:					
Havre	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
Glendive	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding.	Severe: flooding.	Fair: too sandy.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
611B:					
Hingham	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Lonna	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
661C:					
Twilight	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
Blacksheep	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
671B:					
Bearpaw	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Vida	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
671C:					
Bearpaw	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Vida	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
671D:					
Bearpaw	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Vida	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
674B:					
Bearpaw	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Waltham	Severe: percs slowly.	Moderate: slope.	Severe: excess sodium.	Slight	Poor: excess sodium.
696C:					
Vida	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Zahill	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Bearpaw	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
701D:					
Yetull	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: seepage, too sandy.
Busby	Moderate: slope.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
721E:					
Zahill	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Vida	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
722D:					
Zahill	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Vida	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
725F:					
Zahill	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Rock outcrop.					
729F:					
Zahill	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Obrien	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
732C:					
Yetull	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
Lonesome	Severe: percs slowly, poor filter.	Severe: seepage.	Slight	Slight	Good.
761D:					
Hedoes	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Belain	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
761F:					
Hedoes	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
Belain	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
763E:					
Laceycreek	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
791C:					
Yamacall	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Good.
Hillon	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
795C:					
Yamacall	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Good.
Benz	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
799C:					
Yamacall	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Good.
801B:					
Williams	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
Vida	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
801C:					
Williams	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
Vida	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
812A:					
Glendive	Moderate: flooding.	Severe: seepage.	Moderate: flooding, too sandy.	Moderate: flooding.	Fair: too sandy.
831A:					
Straw	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
831A: (cont.)					
Korchea	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
832A:					
Nesda	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy, small stones.
Nesda	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
833A:					
Enbar	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Straw	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
Eagleton	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
842A:					
Bullhook	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
Nobe	Severe: percs slowly.	Slight	Severe: wetness.	Moderate: flooding, wetness.	Poor: hard to pack.
883F:					
Perma	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Whitlash	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: depth to rock, large stones, slope.
892F:					
Whitlash	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Belain	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
892F: (cont.)					
Rock outcrop.					
895F:					
Whitlash--------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Perma-----------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Rock outcrop.					
896F:					
Perma-----------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Whitlash--------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Rock outcrop.					
899F:					
Zahill----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Rock outcrop.					
Whitlash--------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
911F:					
Belain----------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
Whitlash--------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Hedoes----------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
915F:					
Belain	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
Whitlash	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Hedoes	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
951B:					
Kenilworth	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Fortbenton	Severe: percs slowly.	Severe: seepage.	Slight	Slight	Good.
962B:					
Fortbenton	Severe: percs slowly.	Severe: seepage.	Slight	Slight	Good.
965B:					
Fortbenton	Severe: percs slowly.	Severe: seepage.	Slight	Slight	Good.
Chinook	Slight	Severe: seepage.	Slight	Slight	Good.
968C:					
Fortbenton	Severe: percs slowly.	Severe: seepage.	Slight	Slight	Good.
Hillon	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
968D:					
Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Fortbenton	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: slope.
971F:					
Neldore	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.

Sanitary Facilities--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
971F: (cont.)					
Bascovy	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
974F:					
Neldore	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.
Hillon	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
DA: Denied access.					
M-W: Miscellaneous water.					
W: Water.					

Construction Materials

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
13A:				
McKenzie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
16B:				
Degrand	Good	Probable	Probable	Poor: too sandy, small stones.
22E:				
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
22F:				
Hillon	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
24A:				
Hanly	Good	Probable	Improbable: too sandy.	Poor: too sandy.
27B:				
Attewan	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
28A:				
Nishon	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
30A:				
Marvan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
30C:				
Marvan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
31A:				
Ferd	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
32A:				
Kobase	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
33A:				
Phillips	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
34A:				
Dimmick	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
36A:				
Chinook	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
36C:				
Chinook	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
37A:				
Evanston	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
51A:				
Wheatbelt	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
53D:				
Beaverton	Fair: large stones.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
55A:				
Benz	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
60A:				
Havre	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
62C:				
Weingart	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Weingart, thin surface	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
72F:				
Zahill	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
74B:				
Marias	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
75B:				
Farnuf	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
75C:				
Farnuf	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
76B:				
Bowery	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
76C:				
Bowery	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
76D:				
Bowery	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
78A:				
Lostriver	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
79B:				
Yamacall	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
81A:				
Glendive	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, too clayey, small stones.
84A:				
Bullhook	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
90A:				
Harlake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
92B:				
Marmarth	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, thin layer.
93D:				
Tally	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
96B:				
Fortbenton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
96C:				
Fortbenton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
98B:				
Kremlin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
99A:				
Thibadeau	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
110D:				
Laceycreek	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
115B:				
Thoeny	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Elloam	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, excess salt, excess sodium.
171C:				
Delpoint	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, small stones.
Cabbart	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
172C:				
Delpoint, calcareous	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, small stones.
Delpoint	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, small stones.
182F:				
Garlet	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Elkner	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
191F:				
Winkler	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
191F: (cont.)				
Ambrant	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Winkler, dry	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
200F:				
Badland.				
203F:				
Cabba	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Rock outcrop.				
204F:				
Cabba	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Zahill	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
205F:				
Cabba	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Macar	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
211F:				
Cabbart	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Rock outcrop.				
212F:				
Cabbart	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Hillon	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
213E:				
Cabbart	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Yawdim	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
221D:				
Hillon----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Kevin-----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
224D:				
Hillon----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Joplin----------	Good------------------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
241A:				
Hanly-----------	Good------------------	Probable--------------	Improbable: too sandy.	Poor: too sandy.
251D:				
Bascovy---------	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Neldore---------	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
262A:				
Absher----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Gerdrum---------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
272C:				
Attewan---------	Good------------------	Probable--------------	Probable--------------	Poor: too sandy, small stones, area reclaim.
Tinsley---------	Fair: large stones.	Probable--------------	Probable--------------	Poor: too sandy, small stones, area reclaim.
304A:				
Marvan----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
Nobe------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
309A:				
Marvan, saline	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
Marvan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
311B:				
Ferd	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Creed	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Gerdrum	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
321A:				
Kobase	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
331B:				
Phillips	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Elloam	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, excess salt, excess sodium.
334B:				
Phillips	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Kevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
362C:				
Chinook	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Yetull	Good	Probable	Improbable: too sandy.	Poor: too sandy.
375B:				
Evanston	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
Lonna	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt.
381A:				
Ethridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
400F:				
Rubble land.				
Rock outcrop.				
402A:				
Gerdrum	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Absher	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Creed	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
421C:				
Joplin	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
441C:				
Kevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
442C:				
Kevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Elloam	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, excess salt, excess sodium.
501B:				
Telstad	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
503B:				
Telstad	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Joplin	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
503C:				
Telstad	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Joplin	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
522A:				
Elloam	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, excess salt, excess sodium.
Absher	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
530F:				
Warwood	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
561B:				
Scobey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Kevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
561C:				
Scobey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Kevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
564B:				
Scobey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
571D:				
Chinook	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Cozberg	Good	Probable	Probable	Poor: too sandy, small stones.
Yetull	Good	Probable	Improbable: too sandy.	Poor: too sandy.
573B:				
Cozberg	Good	Probable	Probable	Poor: too sandy, small stones.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
573B: (cont.)				
Chinook	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
603A:				
Havre	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Harlake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
604A:				
Havre	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Glendive	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones, excess salt.
611B:				
Hingham	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Lonna	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt.
661C:				
Twilight	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, thin layer.
Blacksheep	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
671B:				
Bearpaw	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Vida	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
671C:				
Bearpaw	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Vida	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
671D:				
Bearpaw	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Vida	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
674B:				
Bearpaw	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Waltham	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
696C:				
Vida	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Zahill	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Bearpaw	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
701D:				
Yetull	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Busby	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
721E:				
Zahill	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Vida	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
722D:				
Zahill	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Vida	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
725F:				
Zahill	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop.				
729F:				
Zahill	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Obrien	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
732C:				
Yetull	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Lonesome	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
761D:				
Hedoes	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Belain	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
761F:				
Hedoes	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Belain	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
763E:				
Laceycreek	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
791C:				
Yamacall	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
795C:				
Yamacall	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
Benz	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
799C:				
Yamacall	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
801B:				
Williams	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Vida	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
801C:				
Williams	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Vida	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
812A:				
Glendive	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, too clayey, small stones.
831A:				
Straw	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Korchea	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
832A:				
Nesda	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Nesda	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
833A:				
Enbar	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Straw	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Eagleton	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
842A:				
Bullhook	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
Nobe	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
883F:				
Perma	Poor: slope.	Improbable: small stones.	Probable	Poor: small stones, area reclaim, slope.
Whitlash	Poor: depth to rock, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, large stones, slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
892F:				
Whitlash--------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Belain----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop.				
895F:				
Whitlash--------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Perma-----------	Poor: slope.	Improbable: small stones.	Probable---------------	Poor: small stones, area reclaim, slope.
Rock outcrop.				
896F:				
Perma-----------	Poor: slope.	Improbable: small stones.	Probable---------------	Poor: small stones, area reclaim, slope.
Whitlash--------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop.				
899F:				
Zahill----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop.				
Whitlash--------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
911F:				
Belain----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Whitlash--------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
911F: (cont.)				
Hedoes	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
915F:				
Belain	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Whitlash	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Hedoes	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
951B:				
Kenilworth	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Fortbenton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
962B:				
Fortbenton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
965B:				
Fortbenton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Chinook	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
968C:				
Fortbenton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
968D:				
Hillon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Fortbenton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
971F:				
Neldore	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.

Construction Materials--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
971F: (cont.)				
Bascovy	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
974F:				
Neldore	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.
Hillon	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
DA: Denied access.				
M-W: Miscellaneous water.				
W: Water.				

Water Management

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
13A: McKenzie	Slight	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, excess salt.	Wetness, droughty, slow intake.	Wetness, percs slowly.	Wetness, excess salt, droughty.
16B: Degrand	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, erodes easily.	Erodes easily, too sandy.	Too arid, erodes easily, droughty.
22E: Hillon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
22F: Hillon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
24A: Hanly	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Too arid, droughty.
27B: Attewan	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily.	Erodes easily, too sandy.	Too arid, erodes easily.
28A: Nishon	Slight	Severe: wetness.	Severe: no water.	Percs slowly.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
30A: Marvan	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Slow intake, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
30C: Marvan	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
31A: Ferd	Slight	Moderate: piping.	Severe: no water.	Deep to water	Percs slowly, erodes easily, excess salt.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
32A: Kobase	Slight	Slight	Severe: no water.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
33A: Phillips	Slight	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
34A:							
Dimmick	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
36A:							
Chinook	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing.	Soil blowing.	Too arid.
36C:							
Chinook	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Soil blowing.	Too arid.
37A:							
Evanston	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily.	Erodes easily.	Too arid, erodes easily.
51A:							
Wheatbelt	Slight	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, excess salt.	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, excess salt, erodes easily.
53D:							
Beaverton	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
55A:							
Benz	Slight	Severe: piping.	Severe: no water.	Deep to water	Droughty, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, excess salt, erodes easily.
60A:							
Havre	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily.	Erodes easily.	Too arid, erodes easily.
62C:							
Weingart	Moderate: depth to rock, slope.	Severe: excess sodium.	Severe: no water.	Deep to water	Slope, droughty, percs slowly.	Depth to rock, erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
Weingart, thin surface	Moderate: depth to rock, slope.	Severe: excess sodium.	Severe: no water.	Deep to water	Slope, droughty, slow intake.	Depth to rock, erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
72F:							
Zahill	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
74B:							
Marias	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Slow intake, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
75B: Farnuf	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Excess salt.	Favorable	Favorable.
75C: Farnuf	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, excess salt.	Favorable	Favorable.
76B: Bowery	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Erodes easily.	Erodes easily
76C: Bowery	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope.	Erodes easily.	Erodes easily
76D: Bowery	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope.	Slope, erodes easily.	Slope, erodes easily.
78A: Lostriver	Slight	Moderate: hard to pack, excess salt.	Severe: no water.	Deep to water	Slow intake, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, excess salt, erodes easily.
79B: Yamacall	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily.	Erodes easily.	Too arid, erodes easily.
81A: Glendive	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, excess salt.	Soil blowing.	Too arid.
84A: Bullhook	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Excess salt.	Favorable	Too arid, excess salt.
90A: Harlake	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Slow intake, percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
92B: Marmarth	Moderate: seepage, depth to rock.	Severe: piping.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Depth to rock, erodes easily.	Too arid, erodes easily, depth to rock.
93D: Tally	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, soil blowing.	Slope.
96B: Fortbenton	Severe: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Too arid, erodes easily, percs slowly.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
96C:							
Fortbenton---	Severe: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Too arid, erodes easily, percs slowly.
98B:							
Kremlin------	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily.	Erodes easily.	Too arid, erodes easily.
99A:							
Thibadeau----	Slight---------	Severe: piping.	Severe: slow refill.	Deep to water	Percs slowly, flooding, excess salt.	Percs slowly.	Too arid, excess salt, percs slowly.
110D:							
Laceycreek---	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope.	Slope, erodes easily.	Slope, erodes easily.
115B:							
Thoeny-------	Slight---------	Severe: excess sodium.	Severe: no water.	Deep to water	Percs slowly, erodes easily. excess sodium.	Erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
Elloam-------	Slight---------	Severe: excess sodium.	Severe: no water.	Deep to water	Droughty, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
171C:							
Delpoint-----	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Depth to rock, erodes easily.	Too arid, erodes easily. depth to rock.
Cabbart------	Severe: depth to rock.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Depth to rock, erodes easily.	Too arid, erodes easily. droughty.
172C:							
Delpoint, calcareous--	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Depth to rock, erodes easily.	Too arid, erodes easily. depth to rock.
Delpoint-----	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Depth to rock, erodes easily.	Too arid, erodes easily. depth to rock.
182F:							
Garlet-------	Severe: slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
Elkner-------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.

Water Management--Continued

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Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
191F:							
Winkler	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, soil blowing.	Large stones, slope, droughty.
Ambrant	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Winkler, dry	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, soil blowing.	Large stones, slope, droughty.
200F: Badland.							
203F:							
Cabba	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Rock outcrop.							
204F:							
Cabba	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Zahill	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
205F:							
Cabba	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Macar	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
211F:							
Cabbart	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Rock outcrop.							
212F:							
Cabbart	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Hillon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
213E:							
Cabbart------	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Yawdim-------	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Too arid, slope, droughty.
221D:							
Hillon-------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Kevin--------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily.	Too arid, slope, erodes easily.
224D:							
Hillon-------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Joplin-------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
241A:							
Hanly--------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Too arid, droughty.
251D:							
Bascovy------	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, droughty, slow intake.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Neldore------	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Too arid, slope, droughty.
262A:							
Absher-------	Slight---------	Severe: excess sodium.	Severe: no water.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Too arid, excess salt, excess sodium.
Gerdrum------	Slight---------	Severe: excess sodium.	Severe: no water.	Deep to water	Droughty, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
272C:							
Attewan------	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily, too sandy.	Too arid, erodes easily.
Tinsley------	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Large stones, too sandy, soil blowing.	Large stones, droughty.

Water Management--Continued

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Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
304A:							
Marvan	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Excess salt, erodes easily, droughty.
Nobe	Slight	Moderate: hard to pack, excess salt.	Severe: no water.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Too arid, excess salt, erodes easily.
309A:							
Marvan, saline	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Excess salt, erodes easily, droughty.
Marvan	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Slow intake, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
311B:							
Ferd	Slight	Moderate: piping.	Severe: no water.	Deep to water	Percs slowly, erodes easily, excess salt.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
Creed	Slight	Severe: excess sodium.	Severe: no water.	Deep to water	Droughty, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
Gerdrum	Slight	Severe: excess sodium.	Severe: no water.	Deep to water	Droughty, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
321A:							
Kobase	Slight	Slight	Severe: no water.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
331B:							
Phillips	Slight	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
Elloam	Slight	Severe: excess sodium.	Severe: no water.	Deep to water	Droughty, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
334B:							
Phillips	Slight	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
Kevin	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily.	Too arid, erodes easily.
362C:							
Chinook	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Soil blowing.	Too arid.

Water Management--Continued

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Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
362C: (cont.)							
Yetull-------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Too arid, droughty.
375B:							
Evanston-----	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily.	Erodes easily.	Too arid, erodes easily.
Lonna--------	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, excess salt.	Erodes easily.	Too arid, erodes easily.
381A:							
Ethridge-----	Slight---------	Moderate: piping.	Severe: no water.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
400F:							
Rubble land.							
Rock outcrop.							
402A:							
Gerdrum------	Slight---------	Severe: excess sodium.	Severe: no water.	Deep to water	Droughty, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
Absher-------	Slight---------	Severe: excess sodium.	Severe: no water.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Too arid, excess salt, excess sodium.
Creed--------	Slight---------	Severe: excess sodium.	Severe: no water.	Deep to water	Droughty, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
421C:							
Joplin-------	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
Hillon-------	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
441C:							
Kevin--------	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily.	Too arid, erodes easily.
Hillon-------	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
442C:							
Kevin--------	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily.	Too arid, erodes easily.

Water Management--Continued

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Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
442C: (cont.)							
Elloam-------	Moderate: slope.	Severe: excess sodium.	Severe: no water.	Deep to water	Slope, droughty, percs slowly.	Erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
501B:							
Telstad------	Slight---------	Severe: piping.	Severe: no water.	Deep to water	Percs slowly, erodes easily.	Erodes easily.	Too arid, erodes easily.
Hillon-------	Slight---------	Moderate: piping.	Severe: no water.	Deep to water	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
503B:							
Telstad------	Slight---------	Severe: piping.	Severe: no water.	Deep to water	Percs slowly, erodes easily.	Erodes easily.	Too arid, erodes easily.
Joplin-------	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
503C:							
Telstad------	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily.	Too arid, erodes easily.
Joplin-------	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
522A:							
Elloam-------	Slight---------	Severe: excess sodium.	Severe: no water.	Deep to water	Droughty, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, excess sodium, erodes easily.
Absher-------	Slight---------	Severe: excess sodium.	Severe: no water.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Too arid, excess salt, excess sodium.
530F:							
Warwood------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
561B:							
Scobey-------	Slight---------	Slight---------	Severe: no water.	Deep to water	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
Kevin--------	Slight---------	Moderate: piping.	Severe: no water.	Deep to water	Percs slowly, erodes easily.	Erodes easily.	Too arid, erodes easily.
561C:							
Scobey-------	Moderate: slope.	Slight---------	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
Kevin--------	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily.	Too arid, erodes easily.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
564B:							
Scobey	Slight	Slight	Severe: no water.	Deep to water	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
Hillon	Slight	Moderate: piping.	Severe: no water.	Deep to water	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
571D:							
Chinook	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, soil blowing.	Too arid, slope.
Cozberg	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Too arid, slope, droughty.
Yetull	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Too arid, slope, droughty.
573B:							
Cozberg	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Too arid, droughty.
Chinook	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing.	Soil blowing.	Too arid.
603A:							
Havre	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable	Too arid.
Harlake	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
604A:							
Havre	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, flooding.	Erodes easily.	Too arid, erodes easily.
Glendive	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, flooding, excess salt.	Soil blowing.	Too arid.
611B:							
Hingham	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily.	Erodes easily.	Too arid, erodes easily.
Lonna	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, excess salt.	Erodes easily.	Too arid, erodes easily.
661C:							
Twilight	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Depth to rock, soil blowing.	Too arid, droughty, depth to rock.

Water Management--Continued

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Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
661C: (cont.)							
Blacksheep---	Severe: depth to rock.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Depth to rock, soil blowing.	Too arid, droughty, depth to rock.
671B:							
Bearpaw------	Slight---------	Moderate: hard to pack.	Severe: no water.	Deep to water	Percs slowly.	Erodes easily.	Erodes easily.
Vida---------	Slight---------	Moderate: piping.	Severe: no water.	Deep to water	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
671C:							
Bearpaw------	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Erodes easily.	Erodes easily.
Vida---------	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
671D:							
Bearpaw------	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily.
Vida---------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
674B:							
Bearpaw------	Slight---------	Moderate: hard to pack.	Severe: no water.	Deep to water	Percs slowly.	Erodes easily.	Erodes easily
Waltham------	Slight---------	Severe: excess sodium.	Severe: no water.	Deep to water	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Excess sodium, erodes easily, rooting depth.
696C:							
Vida---------	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
Zahill-------	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
Bearpaw------	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Erodes easily.	Erodes easily.
701D:							
Yetull-------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Too arid, slope, droughty.
Busby--------	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, soil blowing.	Too arid, slope.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
721E:							
Zahill-------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Vida---------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
722D:							
Zahill-------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Vida---------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
725F:							
Zahill-------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Rock outcrop.							
729F:							
Zahill-------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Obrien-------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
732C:							
Yetull-------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Too arid, droughty.
Lonesome-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Erodes easily, soil blowing, percs slowly.	Too arid, erodes easily, droughty.
761D:							
Hedoes-------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope.	Slope.	Slope.
Belain-------	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, Droughty, depth to rock.
761F:							
Hedoes-------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope.	Slope.	Slope.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
761F: (cont.)							
Belain-------	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
763E:							
Laceycreek---	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope.	Slope, erodes easily.	Slope, erodes easily.
791C:							
Yamacall-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily.	Too arid, erodes easily.
Hillon-------	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
795C:							
Yamacall-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope.	Erodes easily.	Too arid, erodes easily.
Benz---------	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, percs slowly.	Erodes easily, percs slowly.	Too arid, excess salt, erodes easily.
799C:							
Yamacall-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope.	Erodes easily.	Too arid, erodes easily.
801B:							
Williams-----	Slight---------	Severe: piping.	Severe: no water.	Deep to water	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
Vida---------	Slight---------	Moderate: piping.	Severe: no water.	Deep to water	Percs slowly, rooting depth, erodes easily.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
801C:							
Williams-----	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
Vida---------	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth, percs slowly.
812A:							
Glendive-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, excess salt.	Soil blowing.	Too arid.
831A:							
Straw--------	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Favorable------	Favorable.
Korchea------	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily.	Erodes easily.	Erodes easily.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
832A:							
Nesda	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, soil blowing, flooding.	Large stones, too sandy, soil blowing.	Large stones, droughty.
Nesda	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty.	Large stones, too sandy.	Large stones, droughty.
833A:							
Enbar	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding.	Erodes easily.	Erodes easily.
Straw	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.
Eagleton	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
842A:							
Bullhook	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Excess salts, erodes easily.	Excess salt, erodes easily.	Too arid, excess salt, erodes easily.
Nobe	Slight	Moderate: hard to pack, excess salt.	Severe: slow refill.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Too arid, excess salt, erodes easily.
883F:							
Perma	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
Whitlash	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
892F:							
Whitlash	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Belain	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Rock outcrop.							
895F:							
Whitlash	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Perma	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
895F: (cont.)							
Rock outcrop.							
896F:							
Perma--------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
Whitlash-----	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.							
899F:							
Zahill-------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Rock outcrop.							
Whitlash-----	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
911F:							
Belain-------	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Whitlash-----	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Hedoes-------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope.	Slope.	Slope.
915F:							
Belain-------	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Whitlash-----	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Hedoes-------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope.	Slope.	Slope.
951B:							
Kenilworth---	Slight---------	Moderate: piping.	Severe: no water.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Too arid, erodes easily, percs slowly.
Fortbenton---	Severe: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Too arid, erodes easily, percs slowly.

Water Management--Continued

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
962B:							
Fortbenton---	Severe: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
965B:							
Fortbenton---	Severe: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Too arid, erodes easily, percs slowly.
Chinook------	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Soil blowing.	Too arid.
968C:							
Fortbenton---	Severe: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Too arid, erodes easily, percs slowly.
Hillon-------	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
968D:							
Hillon-------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Fortbenton---	Severe: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Slope, erodes easily, soil blowing.	Too arid, slope, erodes easily.
971F:							
Neldore------	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Too arid, slope, droughty.
Bascovy------	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, droughty, slow intake.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
974F:							
Neldore------	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, slow intake.	Slope, depth to rock, percs slowly.	Too arid, slope, droughty.
Hillon-------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
DA: Denied access.							
M-W: Miscellaneous water.							
W: Water.							

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the county, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

The table "Engineering Index Properties" gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the county. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986) and the Unified soil classification system (ASTM, 1993).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by

converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the county and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the county or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

The tables "Physical Properties of the Soils" and "Chemical Properties of the Soils" show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the county. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the table "Physical Properties of the Soils," the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture

content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more than 9 percent, is sometimes used.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table "Physical Properties of Soils," the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility of soil to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. These soils are moderately erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

Cation-exchange capacity is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. Soils having a high cation-exchange capacity can retain cations. The ability to retain cations helps to prevent the pollution of ground water.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the soil. The availability of plant nutrients is influenced by the amount of

carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is given as the percent, by weight, of hydrated calcium sulfates in the soil. Gypsum is partially soluble in water and can be dissolved and removed by water. Soils that have a high content of gypsum (more than 10 percent) may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio is the measure of sodium relative to calcium and magnesium in the water extract from saturated soil paste. Soils having a sodium adsorption ratio of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

The table "Water Features" gives estimates of several important water features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. The soil properties that affect the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include the depth to a seasonal high water table, the intake rate, permeability after prolonged wetting, and the depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well or well drained soils that have a moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils that have a moderately fine or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clayey soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered to be ponding.

The table "Water Features" gives the frequency and duration of flooding and the time of year when flooding is most likely to occur. Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. *None* means flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is 50 percent in any year). The term *common* includes both frequent and occasional flooding.

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very*

long (more than 30 days). The time of year that flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is a zone of saturation at the highest average depth during the wettest season. It is at least 6 inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the surface. Indicated in the table "Water Features" are the depth to the seasonal high water table, the kind of water table, and the months of the year when the water table usually is highest.

An *apparent* water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time for adjustments in the surrounding soil.

A *perched* water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation.

Soil Features

The table "Soil Features" gives estimates of several important soil features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a *moderate* potential indicates that the soil is susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a *high* potential indicates that the soil is highly susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Properties

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
13A:												
McKenzie--------	0-5	Clay.	CH	A-7	0	0	100	100	90-100	80-95	50-75	25-50
	5-60	Clay.	CH	A-7	0	0	100	100	90-100	75-95	50-75	25-50
16B:												
Degrand---------	0-6	Loam.	ML, SM	A-4	0	0-5	85-100	80-100	60-85	40-60	25-35	NP-10
	6-15	Sandy clay loam, clay loam.	CL, SC, CL-ML, SC-SM	A-6, A-4	0	0-5	85-100	80-100	50-90	35-80	25-40	5-15
	15-26	Clay loam, loam, sandy loam.	ML, SM	A-4	0	0-5	85-100	80-100	55-85	40-70	20-35	NP-10
	26-60	Sand, gravelly sand, loamy sand.	SP, SP-SM, SM	A-1, A-3, A-2	0	0-5	65-100	55-100	25-70	0-15	---	NP
22E:												
Hillon----------	0-3	Loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
22F:												
Hillon----------	0-3	Loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
24A:												
Hanly-----------	0-7	Loamy fine sand.	SM	A-2	0	0	100	100	50-75	15-30	---	NP
	7-60	Stratified fine sandy loam to sand.	SM, SP-SM	A-2, A-3	0	0	100	100	50-85	5-25	---	NP
27B:												
Attewan---------	0-6	Loam.	ML, CL-ML	A-4	0	0-5	85-100	80-100	70-90	55-75	20-30	NP-10
	6-17	Clay loam, sandy clay loam, gravelly loam.	CL, SC	A-6	0	0-5	75-100	70-100	55-85	35-70	30-40	10-20
	17-27	Clay loam, gravelly loam, sandy clay loam.	CL, SC, GC	A-6	0	0-5	70-100	65-100	50-85	35-65	30-40	10-20
	27-60	Very gravelly loamy sand, extremely gravelly loamy sand, very gravelly sand.	GP, GP-GM, GM, SM	A-1	0	0-15	25-55	15-50	5-20	0-15	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
28A:												
Nishon----------	0-6	Clay loam.	CL	A-6, A-7	0	0	100	100	85-100	60-85	30-45	10-20
	6-24	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-95	40-65	20-45
	24-60	Clay, silty clay, clay loam.	CL, CH	A-6, A-7	0	0	90-100	90-100	80-100	65-90	35-60	15-40
30A:												
Marvan----------	0-4	Clay.	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	4-32	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	32-60	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
30C:												
Marvan----------	0-4	Clay.	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	4-32	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	32-60	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
31A:												
Ferd------------	0-7	Loam.	CL-ML, CL	A-4	0	0	100	95-100	80-95	55-75	25-30	5-10
	7-15	Clay loam, silty clay loam, clay.	CL	A-6, A-7	0	0	100	95-100	85-100	70-90	35-50	15-30
	15-42	Clay loam, silty clay loam.	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
	42-60	Clay loam, silty clay loam.	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
32A:												
Kobase----------	0-5	Clay loam.	CL	A-6, A-7	0	0	95-100	90-100	60-100	55-80	30-45	10-20
	5-12	Silty clay loam, silty clay, clay.	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-50	15-25
	12-40	Silty clay loam, silty clay, clay.	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-50	15-25
	40-60	Silty clay loam, silty clay, clay.	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-50	15-25
33A:												
Phillips--------	0-10	Loam.	CL-ML	A-4	0	0-5	85-100	80-100	75-100	55-80	20-30	5-10
	10-20	Clay, clay loam.	CL	A-6, A-7	0	0-5	85-100	80-100	70-95	60-85	35-50	15-25
	20-48	Clay loam, loam.	CL	A-6, A-7	0	0-5	85-100	80-100	75-100	55-80	30-45	10-20
	48-60	Clay loam, loam.	CL, CL-ML	A-6, A-4	0	0-5	85-100	80-100	70-90	55-75	25-40	5-15
34A:												
Dimmick---------	0-21	Clay.	CH, CL	A-7	0	0	100	100	90-100	75-95	40-70	15-40
	21-60	Clay, silty clay.	CH, CL	A-7	0	0	100	100	90-100	75-95	45-70	20-45

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
36A:												
Chinook---------	0-4	Fine sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	65-85	30-50	15-25	NP-5
	4-21	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	21-41	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	41-60	Fine sandy loam, loamy fine sand, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	60-80	25-45	15-25	NP-5
36C:												
Chinook---------	0-4	Fine sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	65-85	30-50	15-25	NP-5
	4-21	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	21-41	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	41-60	Fine sandy loam, loamy fine sand, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	60-80	25-45	15-25	NP-5
37A:												
Evanston--------	0-7	Loam.	CL, CL-ML	A-4, A-6	0	0-5	95-100	95-100	85-90	65-70	25-35	5-15
	7-18	Clay loam, loam.	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	18-60	Clay loam, loam, silty clay loam.	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
51A:												
Wheatbelt-------	0-2	Clay.	CH	A-7	0	0	100	100	90-100	75-95	60-80	40-60
	2-16	Clay.	CH	A-7	0	0	100	100	90-100	75-95	60-80	40-60
	16-60	Clay.	CH	A-7	0	0	100	100	90-100	75-95	60-80	40-60
53D:												
Beaverton-------	0-4	Gravelly loam.	CL-ML, SC-SM, GM-GC	A-4, A-2	0	0-10	65-80	60-75	50-70	30-60	25-30	5-10
	4-16	Very gravelly clay loam, very gravelly sandy clay loam.	GM-GC, GC	A-4, A-2, A-6	0	0-25	40-55	35-50	30-45	20-40	25-35	5-15
	16-60	Extremely gravelly loamy sand, extremely gravelly sand, very gravelly loamy sand.	GM, GP, GP-GM, SM	A-1	0	0-30	25-60	15-50	10-35	0-15	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
55A:												
Benz	0-2	Clay loam.	CL	A-6	0	0	100	100	90-100	70-80	30-35	10-15
	2-60	Stratified clay loam to sandy loam.	CL-ML, CL	A-4, A-6	0	0	100	100	80-95	50-75	25-35	5-15
60A:												
Havre	0-5	Loam.	CL-ML	A-4	0	0	100	100	80-95	60-90	20-30	5-10
	5-60	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	0	100	100	80-95	60-80	20-35	5-15
62C:												
Weingart	0-5	Clay loam.	CL	A-6, A-7	0	0	90-100	90-100	65-90	60-85	30-45	10-25
	5-10	Clay, silty clay.	CL, CH	A-7	0	0	90-100	90-100	80-100	75-95	40-65	20-40
	10-16	Clay, silty clay, clay loam.	CL, CH	A-6, A-7	0	0	90-100	90-100	75-100	70-90	35-60	15-35
	16-22	Shaly clay, silty clay, clay loam.	CL, CH, SC, GC	A-6, A-7	0	0	60-95	55-90	50-85	45-80	35-60	15-35
	22-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Weingart, thin surface	0-2	Clay.	CL	A-7	0	0	90-100	90-100	80-100	65-90	40-50	15-25
	2-8	Clay, silty clay.	CL, CH	A-7	0	0	90-100	90-100	80-100	75-95	40-65	20-40
	8-16	Clay, silty clay, clay loam.	CL, CH	A-6, A-7	0	0	90-100	90-100	75-100	70-90	35-60	15-35
	16-22	Shaly clay, silty clay, clay loam.	CL, CH, SC, GC	A-6, A-7	0	0	60-95	55-90	50-85	45-80	35-60	15-35
	22-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
72F:												
Zahill	0-3	Clay loam.	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	3-28	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	28-60	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
74B:												
Marias	0-6	Silty clay.	CL, CH	A-7	0	0	100	100	95-100	90-95	40-60	20-40
	6-30	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	30-60	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
75B:												
Farnuf----------	0-9	Loam.	ML, CL-ML	A-4	0	0	80-100	75-100	60-100	55-80	20-30	NP-10
	9-18	Clay loam, loam, silty clay loam.	CL	A-6	0	0	80-100	75-100	65-95	50-90	25-40	10-20
	18-60	Loam, clay loam, silt loam.	CL, CL-ML	A-6, A-4	0	0	80-100	75-100	65-95	50-80	25-35	5-15
75C:												
Farnuf----------	0-9	Loam.	ML, CL-ML	A-4	0	0	80-100	75-100	60-100	55-80	20-30	NP-10
	9-18	Clay loam, loam, silty clay loam.	CL	A-6	0	0	80-100	75-100	65-95	50-90	25-40	10-20
	18-60	Loam, clay loam, silt loam.	CL, CL-ML	A-6, A-4	0	0	80-100	75-100	65-95	50-80	25-35	5-15
76B:												
Bowery----------	0-24	Loam.	CL-ML	A-4	0	0	90-100	75-100	65-95	50-75	25-30	5-10
	24-44	Loam.	CL-ML	A-4	0	0	90-100	75-100	65-95	50-75	25-30	5-10
	44-60	Loam, gravelly loam, fine sandy loam.	ML, CL-ML, SC-SM, SM	A-4, A-2	0	0-10	70-90	60-85	45-85	30-65	20-30	NP-10
76C:												
Bowery----------	0-24	Loam.	CL-ML	A-4	0	0	90-100	75-100	65-95	50-75	25-30	5-10
	24-44	Loam.	CL-ML	A-4	0	0	90-100	75-100	65-95	50-75	25-30	5-10
	44-60	Loam, gravelly loam, fine sandy loam.	ML, CL-ML, SC-SM, SM	A-4, A-2	0	0-10	70-90	60-85	45-85	30-65	20-30	NP-10
76D:												
Bowery----------	0-24	Loam.	CL-ML	A-4	0	0	90-100	75-100	65-95	50-75	25-30	5-10
	24-44	Loam.	CL-ML	A-4	0	0	90-100	75-100	65-95	50-75	25-30	5-10
	44-60	Loam, gravelly loam, fine sandy loam.	ML, CL-ML, SC-SM, SM	A-4, A-2	0	0-10	70-90	60-85	45-85	30-65	20-30	NP-10
78A:												
Lostriver-------	0-3	Clay.	CL, CH	A-7	0	0	100	100	85-100	75-95	40-60	20-40
	3-9	Stratified clay loam to clay.	CL, CH	A-7, A-6	0	0	100	100	90-100	70-95	35-60	15-40
	9-60	Stratified clay loam to clay.	CL, CH	A-7, A-6	0	0	100	100	90-100	70-95	35-60	15-40
79B:												
Yamacall--------	0-6	Loam.	CL-ML	A-4	0	0-5	85-100	80-100	65-85	55-75	25-30	5-10
	6-40	Loam, silt loam, clay loam.	CL-ML, CL	A-4, A-6	0	0-5	85-100	80-100	60-85	55-75	25-35	5-15
	40-60	Loam, fine sandy loam, silt loam.	CL-ML, SM	A-4, A-2	0	0-5	75-100	70-100	50-80	25-55	15-25	NP-10

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
81A:												
Glendive--------	0-6	Fine sandy loam.	SM, ML	A-2, A-4	0	0	100	100	65-85	30-55	15-20	NP-5
	6-12	Loam, silt loam, sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0	0	100	100	65-95	40-70	15-25	NP-10
	12-60	Stratified loamy fine sand to clay loam.	SM, SC-SM	A-2, A-4	0	0	95-100	75-100	60-90	25-50	15-25	NP-10
84A:												
Bullhook--------	0-3	Clay loam.	CL	A-6	0	0	100	100	90-100	70-80	25-40	10-20
	3-8	Stratified fine sandy loam to clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	70-100	50-80	20-35	5-15
	8-60	Stratified fine sandy loam to clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	70-100	50-80	20-35	5-15
90A:												
Harlake---------	0-10	Clay.	CL, CH	A-7	0	0	100	100	90-100	75-90	40-65	20-40
	10-60	Stratified clay to silt loam.	CL, CH	A-7	0	0	100	100	95-100	85-95	40-70	15-45
92B:												
Marmarth--------	0-6	Loam.	CL-ML, CL	A-4	0	0	100	100	85-95	60-80	25-30	5-10
	6-13	Clay loam, loam, sandy clay loam.	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	60-80	25-40	5-20
	13-30	Loam, fine sandy loam, clay loam.	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	60-80	25-35	5-15
	30-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	NP
93D:												
Tally-----------	0-8	Fine sandy loam.	SM, ML, SC-SM, CL-ML	A-4, A-2	0	0	90-100	80-100	60-100	30-55	20-30	NP-10
	8-31	Fine sandy loam, sandy loam.	SM, SC-SM	A-4, A-2	0	0	90-100	80-100	60-100	25-50	15-25	NP-10
	31-60	Sandy loam, fine sandy loam, loamy fine sand.	SM	A-4, A-2	0	0	90-100	80-100	60-100	15-50	15-25	NP-5
96B:												
Fortbenton------	0-6	Fine sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	6-26	Fine sandy loam, sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	26-60	Silty clay loam, clay loam.	CL	A-6	0	0	100	100	80-95	70-95	30-40	10-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
96C:												
Fortbenton------	0-6	Fine sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	6-26	Fine sandy loam, sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	26-60	Silty clay loam, clay loam.	CL	A-6	0	0	100	100	80-95	70-95	30-40	10-15
98B:												
Kremlin---------	0-6	Loam.	CL-ML	A-4	0	0	95-100	90-100	75-95	50-75	25-30	5-10
	6-19	Loam, silt loam, clay loam.	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	75-95	55-80	25-35	5-15
	19-31	Loam, silt loam, clay loam.	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	75-95	55-80	25-35	5-15
	31-60	Stratified sandy loam to silt loam.	ML, CL-ML	A-4	0	0	90-100	85-100	70-90	50-75	20-30	NP-10
99A:												
Thibadeau-------	0-2	Clay loam.	CL	A-6, A-7	0	0	100	100	90-100	70-80	30-45	10-20
	2-14	Stratified fine sandy loam to clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	75-100	50-80	25-35	5-15
	14-60	Stratified fine sandy loam to clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	75-100	50-80	25-35	5-15
110D:												
Laceycreek------	0-23	Loam.	CL-ML	A-4	0	0-5	90-100	80-100	75-95	55-75	25-30	5-10
	23-30	Loam, clay loam.	CL	A-6	0	0-5	90-100	85-100	70-95	50-80	30-35	10-15
	30-42	Clay loam, sandy clay loam, gravelly clay loam.	CL-ML, CL, SC-SM, SC	A-4, A-6	0	0-5	85-100	75-100	60-95	35-70	25-35	5-15
	42-60	Loam, sandy loam, gravelly sandy loam.	SC-SM, CL-ML, SM, ML	A-2, A-4	0	0-5	80-100	70-100	40-70	25-60	20-30	NP-10
115B:												
Thoeny----------	0-6	Loam.	CL	A-6	0	0-5	95-100	85-95	85-95	65-75	25-35	10-15
	6-14	Clay, clay loam.	CL, CH	A-6, A-7	0	0-5	95-100	85-95	85-95	75-95	35-55	15-30
	14-27	Clay loam, clay.	CL, CH	A-6, A-7	0	0-5	95-100	85-95	85-95	70-80	35-55	15-30
	27-60	Clay loam, clay.	CL, CH	A-6, A-7	0	0-5	95-100	85-95	85-95	70-80	35-55	15-30
Elloam----------	0-4	Clay loam.	CL	A-6	0	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	4-13	Clay loam, clay.	CL	A-6, A-7	0	0-5	95-100	80-100	70-100	55-90	35-50	15-30
	13-18	Clay loam, clay.	CL	A-6, A-7	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	18-60	Clay loam, loam.	CL	A-7, A-6	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
171C:												
Delpoint--------	0-5	Loam.	CL-ML	A-4	0	0	95-100	90-100	75-90	55-75	20-30	5-10
	5-14	Loam, clay loam.	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	80-95	65-85	20-40	5-20
	14-34	Loam, clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	75-90	60-80	20-40	5-20
	34-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Cabbart---------	0-6	Loam.	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	6-15	Silt loam, loam.	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	15-18	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	60-90	55-85	25-35	5-15
	18-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
172C:												
Delpoint, calcareous-----	0-5	Loam.	CL-ML	A-4	0	0	95-100	90-100	75-90	55-75	20-30	5-10
	5-14	Loam, clay loam.	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	80-95	65-85	20-40	5-20
	14-34	Loam, clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	75-90	60-80	20-40	5-20
	34-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Delpoint--------	0-5	Loam.	CL-ML	A-4	0	0	95-100	90-100	75-90	55-75	20-30	5-10
	5-14	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	85-95	65-85	20-40	5-20
	14-34	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	85-95	65-85	20-40	5-20
	34-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
182F:												
Garlet----------	0-4	Cobbly loam.	SM, SC-SM, ML, CL-ML	A-4	0-5	15-25	75-95	70-90	60-85	35-70	20-30	NP-10
	4-16	Extremely cobbly loam, very flaggy loam, very channery sandy loam.	GM, GM-GC	A-1, A-2	0-5	15-45	35-65	30-60	25-50	15-35	20-30	NP-10
	16-28	Extremely cobbly sandy clay loam, very flaggy loam, very channery sandy loam.	GM, GM-GC	A-1, A-2	0-5	25-50	25-60	20-55	15-45	10-30	20-30	NP-10

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
182F: (cont.)												
Garlet (cont.) ---	28-60	Extremely cobbly loam, very flaggy loam, very channery sandy loam.	GM, GM-GC	A-1, A-2	0-5	25-50	25-60	20-50	15-45	10-30	15-30	NP-10
Elkner----------	0-6	Sandy loam.	SM	A-2, A-4	0	0	80-100	75-100	45-70	25-40	20-30	NP-5
	6-16	Gravelly sandy loam, sandy loam, coarse sandy loam.	SM	A-1, A-2	0	0-10	75-100	70-100	35-60	20-35	---	NP
	16-36	Coarse sandy loam, gravelly coarse sandy loam.	SM	A-1, A-2	0	0-10	75-100	70-100	30-60	20-35	---	NP
	36-60	Gravelly loamy coarse sand.	SM	A-1	0	0-15	70-90	60-75	25-50	10-25	---	NP
191F:												
Winkler---------	0-7	Gravelly sandy loam.	SM, GM	A-1, A-2	0	0-5	60-80	55-75	35-60	15-30	15-25	NP-5
	7-15	Very gravelly sandy loam, extremely gravelly sandy loam, very gravelly loam.	GM, GP-GM, SM, SP-SM	A-1	0	0-15	25-60	15-50	10-35	5-20	15-25	NP-5
	15-33	Extremely gravelly sandy loam, extremely gravelly loam.	GM, GP-GM	A-1	0	15-40	20-40	10-30	10-25	5-20	15-25	NP-5
	33-60	Extremely gravelly sandy loam, extremely gravelly fine sandy loam.	GP-GM	A-1	0	15-40	20-40	10-30	10-25	5-10	15-25	NP-5
Ambrant---------	0-6	Sandy loam.	SM	A-2, A-4	0	0-5	85-100	75-95	45-65	25-40	20-25	NP-5
	6-18	Coarse sandy loam, gravelly coarse sandy loam.	SM	A-1, A-2	0	0-5	70-90	60-85	25-55	10-35	20-25	NP-5
	18-33	Coarse sandy loam, gravelly coarse sandy loam.	SM	A-1, A-2	0	0-5	70-90	60-85	25-55	10-35	20-25	NP-5
	33-60	Gravelly loamy coarse sand, gravelly coarse sandy loam, very gravelly loamy sand.	GM, SM	A-1	0	0	45-85	35-75	15-50	5-25	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
191F: (cont.)												
Winkler, dry----	0-7	Gravelly sandy loam.	SM, GM	A-1, A-2	0	0-5	60-80	55-75	35-60	15-30	15-25	NP-5
	7-15	Very gravelly sandy loam, extremely gravelly sandy loam, very gravelly loam.	GM, GP-GM, SM, SP-SM	A-1	0	0-15	25-60	15-50	10-35	5-20	15-25	NP-5
	15-33	Extremely gravelly sandy loam, extremely gravelly loam.	GM, GP-GM	A-1	0	15-40	20-40	10-30	10-25	5-20	15-25	NP-5
	33-60	Extremely gravelly sandy loam, extremely gravelly fine sandy loam.	GP-GM	A-1	0	15-40	20-40	10-30	10-25	5-10	15-25	NP-5
200F: Badland.												
203F:												
Cabba-----------	0-3	Loam.	ML, CL-ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	3-15	Clay loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	15-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Rock outcrop.												
204F:												
Cabba-----------	0-3	Loam.	ML, CL-ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	3-15	Clay loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	15-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Zahill----------	0-3	Loam.	CL-ML, ML	A-4	0	0-10	90-100	85-95	80-90	60-75	20-30	NP-10
	3-28	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	28-60	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
205F:												
Cabba-----------	0-3	Loam.	ML, CL-ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	3-15	Clay loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	15-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
205F: (cont.)												
Macar-----------	0-4	Loam.	CL-ML	A-4	0	0	100	100	75-95	55-70	25-30	5-10
	4-12	Clay loam, loam, silty clay loam.	CL-ML, CL	A-6, A-4	0	0	100	100	75-95	60-85	25-40	5-15
	12-37	Clay loam, loam, silty clay loam.	CL-ML, CL	A-6, A-4	0	0	100	100	75-95	60-85	25-40	5-15
	37-60	Stratified sandy clay loam to silt loam.	CL-ML, CL	A-6, A-4	0	0	90-100	85-100	70-90	50-75	25-35	5-15
211F:												
Cabbart---------	0-6	Loam.	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	6-15	Silt loam, loam	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	15-18	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	60-90	55-85	25-35	5-15
	18-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Rock outcrop.												
212F:												
Cabbart---------	0-6	Loam.	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	6-15	Silt loam, loam.	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	15-18	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	60-90	55-85	25-35	5-15
	18-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Hillon----------	0-3	Loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
213E:												
Cabbart---------	0-6	Loam.	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	6-15	Silt loam, loam.	CL-ML	A-4	0	0	90-100	85-100	65-85	55-75	25-30	5-10
	15-18	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	60-90	55-85	25-35	5-15
	18-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Yawdim----------	0-2	Clay.	CL, CH	A-7	0	0	100	100	95-100	80-95	40-55	20-35
	2-15	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	0	100	100	90-100	70-95	40-60	15-35
	15-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
221D:												
Hillon----------	0-3	Clay loam.	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Kevin-----------	0-6	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	6-9	Clay loam, clay.	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-47	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	47-60	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
224D:												
Hillon----------	0-3	Loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Joplin----------	0-5	Loam.	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	5-9	Loam, clay loam.	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam.	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam.	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
241A:												
Hanly-----------	0-7	Loamy fine sand.	SM	A-2	0	0	100	100	50-75	15-30	---	NP
	7-60	Stratified fine sandy loam to sand.	SM, SP-SM	A-2, A-3	0	0	100	100	50-85	5-25	---	NP
251D:												
Bascovy---------	0-5	Clay.	CH, CL	A-7	0	0	90-100	75-100	70-95	60-95	40-60	20-35
	5-11	Clay, silty clay.	CH	A-7	0	0	90-100	75-100	70-95	60-95	50-70	25-45
	11-15	Clay, silty clay.	CH	A-7	0	0	90-100	75-100	70-95	60-95	50-70	25-45
	15-26	Clay, silty clay.	CH	A-7	0	0	90-100	75-100	70-95	60-95	50-70	25-45
	26-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Neldore---------	0-3	Clay.	CL, CH	A-7	0	0-10	95-100	90-100	75-100	70-95	40-55	20-30
	3-10	Clay, silty clay.	CL, CH	A-7	0	0	90-100	85-100	70-95	65-90	40-60	20-40
	10-16	Clay, silty clay.	CL, CH	A-7	0	0-5	85-100	80-100	65-95	60-90	40-60	20-40
	16-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
262A:												
Absher----------	0-2	Clay.	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-35
	2-12	Silty clay, clay, clay loam.	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-40
	12-60	Clay loam, clay, silty clay.	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-55	20-35
Gerdrum---------	0-3	Clay loam.	CL	A-6	0	0	80-100	75-100	65-95	60-90	25-40	10-20
	3-19	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	0	90-100	90-100	85-100	75-95	40-60	20-40
	19-60	Clay loam, sandy clay loam, clay.	CL, SC, CH	A-6, A-7	0	0	90-100	90-100	80-95	45-75	35-55	15-35
272C:												
Attewan---------	0-6	Loam.	ML, CL-ML	A-4	0	0-5	85-100	80-100	70-90	55-75	20-30	NP-10
	6-17	Clay loam, sandy clay loam, gravelly loam.	CL, SC	A-6	0	0-5	75-100	70-100	55-85	35-70	30-40	10-20
	17-27	Clay loam, gravelly loam, sandy clay loam.	CL, SC, GC	A-6	0	0-5	70-100	65-100	50-85	35-65	30-40	10-20
	27-60	Very gravelly loamy sand, extremely gravelly loamy sand, very gravelly sand.	GP, GP-GM, GM, SM	A-1	0	0-15	25-55	15-50	5-20	0-15	---	NP
Tinsley---------	0-7	Gravelly sandy loam.	SM	A-2, A-1	0	0-10	70-90	55-75	35-55	15-35	15-20	NP-5
	7-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand.	GM, SM, SP-SM, GP-GM	A-1	0	10-40	40-70	25-55	10-35	5-15	---	NP
304A:												
Marvan----------	0-4	Clay.	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	4-13	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	13-60	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
Nobe------------	0-4	Clay.	CL, CH	A-7	0	0	100	100	90-100	80-95	40-55	15-30
	4-17	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	0	100	100	95-100	90-95	40-60	20-35
	17-60	Stratified loam to clay.	CL, CH	A-7, A-6	0	0	100	100	85-100	75-90	35-55	15-30

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
309A:												
Marvan, saline--	0-4	Clay.	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	4-13	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	13-60	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
Marvan----------	0-4	Clay.	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	4-32	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	32-60	Clay, silty clay.	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
311B:												
Ferd------------	0-7	Loam.	CL-ML, CL	A-4	0	0	100	95-100	80-95	55-75	25-30	5-10
	7-15	Clay loam, silty clay loam, clay.	CL	A-6, A-7	0	0	100	95-100	85-100	70-90	35-50	15-30
	15-42	Clay loam, silty clay loam.	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
	42-60	Clay loam, silty clay loam.	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
Creed-----------	0-7	Loam.	CL-ML, SC-SM	A-4	0	0	90-100	75-100	65-95	45-75	20-30	5-10
	7-16	Silty clay, clay, silty clay loam.	CL, CH	A-6, A-7	0	0	90-100	75-100	70-100	60-95	35-60	15-35
	16-29	Silty clay loam, clay loam, clay	CL, SC	A-6, A-7	0	0	90-100	75-100	60-100	35-90	30-50	15-25
	29-60	Stratified loam to silty clay loam.	CL	A-6, A-7	0	0	90-100	75-100	65-100	50-90	30-45	10-20
Gerdrum---------	0-3	Clay loam.	CL	A-6	0	0	80-100	75-100	65-95	60-90	25-40	10-20
	3-19	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	0	90-100	90-100	85-100	75-95	40-60	20-40
	19-60	Clay loam, sandy clay loam, clay.	CL, SC, CH	A-6, A-7	0	0	90-100	90-100	80-95	45-75	35-55	15-35
321A:												
Kobase----------	0-5	Clay loam.	CL	A-6, A-7	0	0	95-100	90-100	60-100	55-80	30-45	10-20
	5-40	Silty clay loam, silty clay, clay.	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
	40-60	Silty clay loam, silty clay, clay.	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
331B:												
Phillips---------	0-10	Loam.	CL-ML	A-4	0	0-5	85-100	80-100	75-100	55-80	20-30	5-10
	10-20	Clay, clay loam.	CL	A-6, A-7	0	0-5	85-100	80-100	70-95	60-85	35-50	15-25
	20-40	Clay loam, loam.	CL	A-6, A-7	0	0-5	85-100	80-100	75-100	55-80	30-45	10-20
	40-60	Clay loam, loam.	CL, CL-ML	A-6, A-4	0	0-5	85-100	80-100	70-90	55-75	25-40	5-15
Elloam-----------	0-4	Clay loam.	CL	A-6	0	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	4-13	Clay loam, clay.	CL	A-6, A-7	0	0-5	95-100	80-100	70-100	55-90	35-50	15-30
	13-18	Clay loam, clay.	CL	A-6, A-7	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	18-60	Clay loam, loam.	CL	A-7, A-6	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
334B:												
Phillips---------	0-10	Loam.	CL-ML	A-4	0	0-5	85-100	80-100	75-100	55-80	20-30	5-10
	10-20	Clay, clay loam.	CL	A-6, A-7	0	0-5	85-100	80-100	70-95	60-85	35-50	15-25
	20-48	Clay loam, loam.	CL	A-6, A-7	0	0-5	85-100	80-100	75-100	55-80	30-45	10-20
	48-60	Clay loam, loam.	CL, CL-ML	A-6, A-4	0	0-5	85-100	80-100	70-90	55-75	25-40	5-15
Kevin------------	0-6	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	6-9	Clay loam, clay.	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-47	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	47-60	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
362C:												
Chinook----------	0-4	Fine sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	65-85	30-50	15-25	NP-5
	4-21	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	21-41	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	41-60	Fine sandy loam, loamy fine sand, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	60-80	25-45	15-25	NP-5
Yetull-----------	0-8	Loamy fine sand.	SM	A-2	0	0-5	95-100	95-100	50-75	10-30	---	NP
	8-60	Loamy coarse sand, sand, loamy sand.	SM, SP-SM	A-1, A-3, A-2	0	0-5	95-100	95-100	45-70	5-30	---	NP
375B:												
Evanston---------	0-7	Loam.	CL, CL-ML	A-4, A-6	0	0-5	95-100	95-100	85-90	65-70	25-35	5-15
	7-18	Clay loam, loam.	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	18-60	Clay loam, loam, silty clay loam.	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
375B: (cont.)												
Lonna-----------	0-6	Loam.	CL-ML	A-4	0	0	100	100	90-100	75-90	25-30	5-10
	6-11	Silt loam, silty clay loam.	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15
	11-52	Silt loam, silty clay loam.	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15
	52-60	Silty clay loam, silt loam, very fine sandy loam.	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-90	25-35	5-15
381A:												
Ethridge--------	0-7	Clay loam.	CL	A-6	0	0	100	95-100	85-100	70-80	25-40	10-20
	7-15	Silty clay, silty clay loam, clay.	CL	A-7	0	0	100	95-100	95-100	90-95	40-50	20-30
	15-33	Clay loam, silty clay loam, clay.	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	35-50	15-30
	33-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	30-50	10-25
400F:												
Rubble land.												
Rock outcrop.												
402A:												
Gerdrum---------	0-3	Clay loam.	CL	A-6	0	0	80-100	75-100	65-95	60-90	25-40	10-20
	3-19	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	0	90-100	90-100	85-100	75-95	40-60	20-40
	19-60	Clay loam, sandy clay loam, clay.	CL, SC, CH	A-6, A-7	0	0	90-100	90-100	80-95	45-75	35-55	15-35
Absher----------	0-2	Clay.	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-35
	2-8	Silty clay, clay, clay loam.	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-40
	8-60	Clay loam, clay, silty clay.	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-55	20-35
Creed-----------	0-7	Loam.	CL-ML, SC-SM	A-4	0	0	90-100	75-100	65-95	45-75	20-30	5-10
	7-16	Silty clay, clay, silty clay loam.	CL, CH	A-6, A-7	0	0	90-100	75-100	70-100	60-95	35-60	15-35
	16-29	Silty clay loam, clay loam, clay.	CL, SC	A-6, A-7	0	0	90-100	75-100	60-100	35-90	30-50	15-25
	29-60	Stratified loam to silty clay loam.	CL	A-6, A-7	0	0	90-100	75-100	65-100	50-90	30-45	10-20

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
421C:												
Joplin----------	0-5	Loam.	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	5-9	Loam, clay loam.	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam.	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam.	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
Hillon----------	0-3	Loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
441C:												
Kevin-----------	0-6	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	6-9	Clay loam, clay.	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-47	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	47-60	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
Hillon----------	0-3	Clay loam.	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
442C:												
Kevin-----------	0-6	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	6-9	Clay loam, clay.	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-47	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	47-60	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
Elloam----------	0-4	Clay loam.	CL	A-6	0	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	4-13	Clay loam, clay.	CL	A-6, A-7	0	0-5	95-100	80-100	70-100	55-90	35-50	15-30
	13-18	Clay loam, clay.	CL	A-6, A-7	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	18-60	Clay loam, loam.	CL	A-7, A-6	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
501B:												
Telstad---------	0-6	Loam.	CL-ML	A-4	0	0-5	85-100	80-100	65-90	50-70	25-30	5-10
	6-12	Clay loam, loam.	CL	A-6	0	0-5	95-100	90-100	80-95	60-80	30-40	10-20
	12-40	Clay loam, loam.	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	80-95	60-80	25-35	5-15
	40-60	Loam, clay loam.	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	75-90	55-75	25-35	5-15
Hillon----------	0-3	Loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
503B:												
Telstad---------	0-6	Loam.	CL-ML	A-4	0	0-5	85-100	80-100	65-90	50-70	25-30	5-10
	6-12	Clay loam, loam.	CL	A-6	0	0-5	95-100	90-100	80-95	60-80	30-40	10-20
	12-40	Clay loam, loam.	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	80-95	60-80	25-35	5-15
	40-60	Loam, clay loam.	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	75-90	55-75	25-35	5-15
Joplin----------	0-5	Loam.	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	5-9	Loam, clay loam.	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam.	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam.	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
503C:												
Telstad---------	0-6	Loam.	CL-ML	A-4	0	0-5	85-100	80-100	65-90	50-70	25-30	5-10
	6-12	Clay loam, loam.	CL	A-6	0	0-5	95-100	90-100	80-95	60-80	30-40	10-20
	12-40	Clay loam, loam.	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	80-95	60-80	25-35	5-15
	40-60	Loam, clay loam.	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	75-90	55-75	25-35	5-15
Joplin----------	0-5	Loam.	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	5-9	Loam, clay loam.	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam.	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam.	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
522A:												
Elloam----------	0-4	Clay loam.	CL	A-6	0	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	4-13	Clay loam, clay.	CL	A-6, A-7	0	0-5	95-100	80-100	70-100	55-90	35-50	15-30
	13-18	Clay loam, clay.	CL	A-6, A-7	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	18-60	Clay loam, loam.	CL	A-7, A-6	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
Absher----------	0-2	Clay.	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-35
	2-8	Silty clay, clay, clay loam.	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-40
	8-60	Clay loam, clay, silty clay.	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-55	20-35

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
530F:												
Warwood----------	0-4	Loam.	CL-ML	A-4	0	0-5	85-100	80-95	70-80	50-70	25-30	5-10
	4-15	Loam, sandy loam, sandy clay loam.	CL-ML, SC-SM	A-4, A-2	0	0-5	85-100	80-95	50-80	30-60	25-30	5-10
	15-20	Sandy clay loam, clay loam.	CL-ML, CL, SC-SM, SC	A-4, A-6	0	0-5	85-100	80-95	65-90	35-65	25-35	5-15
	20-45	Clay loam, gravelly clay loam.	CL	A-6	0	0-10	75-95	70-90	65-85	50-70	30-35	10-15
	45-60	Clay loam, sandy clay loam, gravelly sandy clay loam.	CL-ML, CL, SC-SM, SC	A-4, A-6	0	0-10	70-95	65-90	60-85	30-70	25-35	5-15
561B:												
Scobey-----------	0-6	Clay loam.	CL	A-6	0	0-5	85-100	75-95	70-90	65-80	25-40	10-20
	6-14	Clay, clay loam.	CL	A-7, A-6	0	0-5	85-100	85-95	80-95	65-90	35-50	15-30
	14-60	Clay loam.	CL	A-6, A-7	0	0-5	85-100	75-95	70-90	65-80	35-45	15-25
Kevin------------	0-6	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	6-9	Clay loam, clay.	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-47	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	47-60	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
561C:												
Scobey-----------	0-6	Clay loam.	CL	A-6	0	0-5	85-100	75-95	70-90	65-80	25-40	10-20
	6-14	Clay, clay loam.	CL	A-7, A-6	0	0-5	85-100	85-95	80-95	65-90	35-50	15-30
	14-60	Clay loam.	CL	A-6, A-7	0	0-5	85-100	75-95	70-90	65-80	35-45	15-25
Kevin------------	0-6	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	6-9	Clay loam, clay.	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-47	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	47-60	Clay loam.	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
564B:												
Scobey-----------	0-6	Clay loam.	CL	A-6	0	0-5	85-100	75-95	70-90	65-80	25-40	10-20
	6-14	Clay, clay loam.	CL	A-7, A-6	0	0-5	85-100	85-95	80-95	65-90	35-50	15-30
	14-60	Clay loam.	CL	A-6, A-7	0	0-5	85-100	75-95	70-90	65-80	35-45	15-25
Hillon-----------	0-3	Clay loam.	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
571D:												
Chinook---------	0-4	Fine sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	65-85	30-50	15-25	NP-5
	4-21	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	21-41	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	41-60	Fine sandy loam, loamy fine sand, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	60-80	25-45	15-25	NP-5
Cozberg---------	0-7	Fine sandy loam.	SM	A-4	0	0	95-100	95-100	70-85	35-50	20-30	NP-5
	7-17	Fine sandy loam, very fine sandy loam, sandy loam.	SM, ML	A-4	0	0	95-100	80-100	60-90	35-60	20-30	NP-5
	17-24	Fine sandy loam, sandy loam, very fine sandy loam.	SM	A-3	0	0	60-100	50-95	25-70	5-30	20-30	NP-5
	24-60	Loamy sand, sand, gravelly loamy sand.	SM, SP-SM	A-1, A-2, A-3	0	0	60-100	50-95	25-70	5-30	---	NP
Yetull----------	0-8	Fine sandy loam.	SM, ML	A-4	0	0-5	95-100	95-100	70-90	35-55	---	NP
	8-60	Loamy coarse sand, sand, loamy sand.	SM, SP-SM	A-1, A-3, A-2	0	0-5	95-100	95-100	45-70	5-30	---	NP
573B:												
Cozberg---------	0-7	Fine sandy loam.	SM	A-4	0	0	95-100	95-100	70-85	35-50	20-30	NP-5
	7-17	Fine sandy loam, very fine sandy loam, sandy loam.	SM, ML	A-4	0	0	95-100	80-100	60-90	35-60	20-30	NP-5
	17-24	Fine sandy loam, sandy loam, very fine sandy loam.	SM	A-3	0	0	60-100	50-95	25-70	5-30	20-30	NP-5
	24-60	Loamy sand, sand, gravelly loamy sand.	SM, SP-SM	A-1, A-2, A-3	0	0	60-100	50-95	25-70	5-30	---	NP
Chinook---------	0-4	Fine sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	65-85	30-50	15-25	NP-5
	4-21	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
573B: (cont.)												
Chinook (cont.)	21-41	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	41-60	Fine sandy loam, loamy fine sand, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	60-80	25-45	15-25	NP-5
603A:												
Havre	0-5	Clay loam.	CL	A-6	0	0	100	100	85-100	75-95	30-40	10-20
	5-60	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	0	100	100	80-95	60-80	20-35	5-15
Harlake	0-10	Clay loam.	CL	A-6, A-7	0	0	100	100	95-100	80-90	30-45	10-20
	10-60	Stratified clay to silt loam.	CL, CH	A-7	0	0	100	100	95-100	85-95	40-70	15-45
604A:												
Havre	0-5	Loam.	CL-ML	A-4	0	0	100	100	80-95	60-90	20-30	5-10
	5-60	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	0	100	100	70-95	60-80	20-35	5-15
Glendive	0-6	Fine sandy loam.	SM, ML, SC-SM, CL-ML	A-4, A-2	0	0	100	100	65-85	30-55	20-30	NP-10
	6-12	Loam, silt loam, sandy loam.	ML, CL-ML, SM, SC-SM	A-4	0	0	100	100	65-95	40-70	15-30	NP-10
	12-60	Stratified loamy fine sand to silt loam.	SM, SC-SM	A-2, A-4	0	0	95-100	75-100	60-80	25-50	15-25	NP-10
611B:												
Hingham	0-7	Loam.	ML	A-4	0	0	100	100	85-95	60-75	20-30	NP-5
	7-14	Loam, silt loam, very fine sandy loam.	ML	A-4	0	0	100	100	85-100	50-90	20-25	NP-5
	14-60	Silt loam, very fine sandy loam.	ML	A-4	0	0	100	100	85-100	50-90	20-25	NP-5
Lonna	0-6	Loam.	CL-ML	A-4	0	0	100	100	90-100	75-90	25-30	5-10
	6-11	Silt loam, silty clay loam.	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15
	11-52	Silt loam, silty clay loam.	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
611B: (cont.)												
Lonna (cont.) ----	52-60	Silty clay loam, silt loam, very fine sandy loam.	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-90	25-35	5-15
661C:												
Twilight--------	0-6	Fine sandy loam.	SM	A-4	0	0	100	100	60-90	35-50	20-30	NP-5
	6-14	Fine sandy loam, sandy loam.	SM	A-4	0	0	100	100	60-90	35-50	20-30	NP-5
	14-29	Fine sandy loam, sandy loam.	SM	A-4	0	0	100	100	60-90	35-50	20-30	NP-5
	29-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Blacksheep------	0-6	Fine sandy loam.	SM, ML	A-4	0	0-5	90-100	85-100	60-85	35-55	15-25	NP-5
	6-17	Fine sandy loam, sandy loam, very fine sandy loam.	SM	A-4	0	0-5	90-100	85-100	60-80	35-50	15-25	NP-5
	17-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
671B:												
Bearpaw---------	0-5	Clay loam.	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	5-13	Clay loam, clay.	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	13-41	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	41-60	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
Vida------------	0-5	Clay loam.	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-8	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	8-22	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	22-60	Clay loam, loam.	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
671C:												
Bearpaw---------	0-5	Clay loam.	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	5-13	Clay loam, clay.	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	13-41	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	41-60	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
671C: (cont.)												
Vida------------	0-5	Clay loam.	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-8	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	8-22	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	22-60	Clay loam, loam.	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
671D:												
Bearpaw---------	0-5	Clay loam.	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	5-13	Clay loam, clay.	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	13-41	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	41-60	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
Vida------------	0-5	Clay loam.	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-8	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	8-22	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	22-60	Clay loam, loam.	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
674B:												
Bearpaw---------	0-5	Clay loam.	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	5-13	Clay loam, clay.	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	13-41	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	41-60	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
Waltham---------	0-2	Clay loam.	CL	A-6	0	0	90-100	90-100	80-100	65-80	30-40	10-20
	2-10	Clay.	CL, CH	A-7	0	0	90-100	90-100	80-100	65-95	45-60	25-35
	10-17	Clay loam, clay.	CL	A-6, A-7	0	0	90-100	90-100	80-100	65-90	35-45	15-20
	17-60	Clay loam.	CL	A-6, A-7	0	0	90-100	90-100	80-100	65-90	35-45	15-20
696C:												
Vida------------	0-5	Clay loam.	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-8	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	8-22	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	22-60	Clay loam, loam.	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Zahill----------	0-3	Clay loam.	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	3-28	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	28-60	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
696C: (cont.)												
Bearpaw---------	0-5	Clay loam.	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	5-13	Clay loam, clay.	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	13-41	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	41-60	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
701D:												
Yetull----------	0-8	Fine sandy loam.	SM, ML	A-4	0	0-5	95-100	95-100	70-90	35-55	---	NP
	8-60	Loamy coarse sand, sand, loamy sand.	SM, SP-SM	A-1, A-3, A-2	0	0-5	95-100	95-100	45-70	5-30	---	NP
Busby-----------	0-4	Fine sandy loam.	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	4-14	Fine sandy loam, sandy loam, loam.	SM, ML	A-4	0	0	100	100	60-90	35-75	20-25	NP-5
	14-41	Fine sandy loam, sandy loam.	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	41-60	Loamy fine sand, loamy sand, fine sandy loam.	SM	A-2, A-4	0	0	100	100	60-85	20-50	15-25	NP-5
721E:												
Zahill----------	0-3	Clay loam.	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	3-28	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	28-60	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
Vida------------	0-5	Clay loam.	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-8	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	8-22	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	22-60	Clay loam, loam.	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
722D:												
Zahill----------	0-3	Clay loam.	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	3-28	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	28-60	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
Vida------------	0-5	Clay loam.	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	5-8	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	8-22	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	22-60	Clay loam, loam.	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
725F:												
Zahill----------	0-3	Clay loam.	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	3-28	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	28-60	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
Rock outcrop.												
729F:												
Zahill----------	0-3	Clay loam.	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	3-28	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	28-60	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
Obrien----------	0-21	Clay loam.	CL	A-6	0	0	100	100	90-100	70-80	30-40	10-20
	21-37	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0	100	100	85-100	60-80	20-40	5-20
	37-60	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0	100	100	85-100	60-80	20-40	5-20
732C:												
Yetull----------	0-8	Loamy fine sand.	SM	A-2	0	0-5	95-100	95-100	50-75	10-30	---	NP
	8-60	Loamy coarse sand, sand, loamy sand.	SM, SP-SM	A-1, A-3, A-2	0	0-5	95-100	95-100	45-70	5-30	---	NP
Lonesome--------	0-5	Loamy fine sand.	SM	A-2	0	0-2	95-100	95-100	80-90	25-35	15-20	NP-5
	5-15	Loamy fine sand, loamy sand, fine sand.	SM	A-2	0	0-2	95-100	95-100	50-90	15-35	15-20	NP-5
	15-30	Loamy fine sand, loamy sand, fine sand.	SM	A-2	0	0-2	95-100	95-100	50-90	15-35	15-20	NP-5
	30-60	Clay loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0-5	95-100	95-100	85-100	60-85	25-35	5-15
761D:												
Hedoes----------	0-5	Loam.	ML, SM	A-4	0	0-15	85-100	75-100	65-95	45-75	25-35	NP-5
	5-34	Loam, sandy loam.	ML, SM	A-4	0	0-15	90-100	85-100	65-95	45-75	25-35	NP-5
	34-60	Very gravelly coarse sandy loam, gravelly sandy loam.	GM, SM	A-1	0	0-15	45-65	30-55	15-35	10-20	---	NP
Belain----------	0-3	Loam.	ML, CL-ML	A-4	0	0-5	95-100	85-100	65-95	50-75	20-30	NP-10
	3-12	Sandy loam, loam, gravelly loam.	ML, SM, CL-ML, SC-SM	A-4	0	0-5	75-100	65-95	50-80	35-65	20-30	NP-10

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
761D: (cont.)												
Belain (cont.)	12-18	Gravelly sandy loam, gravelly loam.	ML, SM, CL-ML, SC-SM	A-2, A-4, A-1	0	0-5	65-85	55-75	35-70	20-55	20-30	NP-10
	18-32	Very gravelly loam, very gravelly sandy loam, gravelly loam.	GM, GM-GC, SM, SC-SM	A-1, A-2, A-4	0	0-5	45-75	35-65	25-55	15-40	20-30	NP-10
	32-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
761F:												
Hedoes	0-5	Loam.	ML, SM	A-4	0	0-15	85-100	75-100	65-95	45-75	25-35	NP-5
	5-34	Loam, sandy loam.	ML, SM	A-4	0	0-15	90-100	85-100	65-95	45-75	25-35	NP-5
	34-60	Very gravelly coarse sandy loam, gravelly sandy loam.	GM, SM	A-1	0	0-15	45-65	30-55	15-35	10-20	---	NP
Belain	0-3	Loam.	ML, CL-ML	A-4	0	0-5	95-100	85-100	65-95	50-75	20-30	NP-10
	3-12	Sandy loam, loam, gravelly loam.	ML, SM, CL-ML, SC-SM	A-4	0	0-5	75-100	65-95	50-80	35-65	20-30	NP-10
	12-18	Gravelly sandy loam, gravelly loam.	ML, SM, CL-ML, SC-SM	A-2, A-4, A-1	0	0-5	65-85	55-75	35-70	20-55	20-30	NP-10
	18-32	Very gravelly loam, very gravelly sandy loam, gravelly loam.	GM, GM-GC, SM, SC-SM	A-1, A-2, A-4	0	0-5	45-75	35-65	25-55	15-40	20-30	NP-10
	32-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
763E:												
Laceycreek	0-23	Loam.	CL-ML	A-4	0	0-5	90-100	80-100	75-95	55-75	25-30	5-10
	23-30	Loam, clay loam.	CL	A-6	0	0-5	90-100	85-100	70-95	50-80	30-35	10-15
	30-42	Clay loam, sandy clay loam, gravelly clay loam.	CL-ML, CL, SC-SM, SC	A-4, A-6	0	0-5	85-100	75-100	60-95	35-70	25-35	5-15
	42-60	Loam, sandy loam, gravelly sandy loam.	SC-SM, CL-ML, SM, ML	A-2, A-4	0	0-5	80-100	70-100	40-70	25-60	20-30	NP-10
791C:												
Yamacall	0-6	Loam.	CL-ML	A-4	0	0-5	85-100	80-100	65-85	55-75	25-30	5-10
	6-40	Loam, silt loam, clay loam.	CL-ML, CL	A-4, A-6	0	0-5	85-100	80-100	60-85	55-75	25-35	5-15
	40-60	Loam, fine sandy loam, silt loam.	CL-ML, SM	A-4, A-2	0	0-5	75-100	70-100	50-80	25-55	15-25	NP-10

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
791C: (cont.)												
Hillon----------	0-3	Loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
795C:												
Yamacall--------	0-6	Clay loam.	CL	A-6	0	0-5	85-100	80-100	65-90	60-80	30-35	10-15
	6-40	Loam, silt loam, clay loam.	CL-ML, CL	A-4, A-6	0	0-5	85-100	80-100	60-85	55-75	25-35	5-15
	40-60	Loam, fine sandy loam, silt loam.	CL-ML, SM	A-4, A-2	0	0-5	75-100	70-100	50-80	25-55	15-25	NP-10
Benz------------	0-2	Clay loam.	CL	A-6	0	0	100	100	90-100	70-80	30-35	10-15
	2-60	Stratified clay loam to sandy loam.	CL-ML, CL	A-4, A-6	0	0	100	100	80-95	50-75	25-35	5-15
799C:												
Yamacall--------	0-6	Clay loam.	CL	A-6	0	0-5	85-100	80-100	65-90	60-80	30-35	10-15
	6-40	Loam, silt loam, clay loam.	CL-ML, CL	A-4, A-6	0	0-5	85-100	80-100	60-85	55-75	25-35	5-15
	40-60	Loam, fine sandy loam, silt loam.	CL-ML, SM	A-4, A-2	0	0-5	75-100	70-100	50-80	25-55	15-25	NP-10
801B:												
Williams--------	0-4	Loam.	CL-ML, CL	A-4	0	0-5	95-100	85-100	85-95	75-90	20-30	5-10
	4-14	Clay loam, loam.	CL-ML, CL	A-4, A-6	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
	14-60	Clay loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
Vida------------	0-5	Loam.	CL-ML	A-4	0	0-10	90-100	85-95	70-90	55-75	20-30	5-10
	5-8	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	8-22	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	22-60	Clay loam, loam.	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
801C:												
Williams--------	0-4	Loam.	CL-ML, CL	A-4	0	0-5	95-100	85-100	85-95	75-90	20-30	5-10
	4-14	Clay loam, loam.	CL-ML, CL	A-4, A-6	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
	14-60	Clay loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
801C: (cont.)												
Vida	0-5	Loam.	CL-ML	A-4	0	0-10	90-100	85-95	70-90	55-75	20-30	5-10
	5-8	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	8-22	Clay loam, loam.	CL	A-6, A-7	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	22-60	Clay loam, loam.	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
812A:												
Glendive	0-6	Fine sandy loam.	SM	A-4	0	0	100	100	65-85	35-50	15-20	NP-5
	6-12	Loam, silt loam, sandy loam.	ML, SM	A-4	0	0	100	100	65-95	40-70	15-25	NP-5
	12-60	Stratified loamy fine sand to clay loam.	SM	A-4, A-2	0	0	95-100	75-100	60-90	25-50	15-25	NP-5
831A:												
Straw	0-41	Loam.	CL-ML	A-4	0	0	100	100	80-100	60-85	25-30	5-10
	41-60	Loam, silt loam, clay loam.	CL-ML, CL	A-6, A-4	0	0	100	100	80-100	60-85	25-35	5-15
Korchea	0-6	Loam.	CL-ML, CL	A-4	0	0	100	100	85-95	60-75	25-30	5-10
	6-60	Stratified fine sandy loam to silty clay loam.	CL-ML, CL	A-4	0	0	100	100	85-95	60-75	25-30	5-10
832A:												
Nesda	0-13	Very gravelly sandy loam.	GM	A-1	0	0-10	35-60	30-50	20-35	10-20	15-25	NP-5
	13-60	Very gravelly sand, very gravelly loamy sand, extremely gravelly sand.	GP, GM, GP-GM, SP-SM	A-1	0	0-25	25-60	15-50	5-35	0-15	---	NP
Nesda	0-13	Gravelly loam.	ML, SM, GM	A-2, A-4	0	0-5	60-80	55-75	40-65	25-55	15-25	NP-5
	13-60	Very gravelly sand, very gravelly loamy sand, extremely gravelly sand.	GP, GM, GP-GM, SP-SM	A-1	0	0-25	25-60	15-50	5-40	0-20	---	NP
833A:												
Enbar	0-23	Loam.	CL-ML	A-4	0	0	80-100	75-100	60-85	50-75	20-30	5-10
	23-30	Loam, clay loam.	CL-ML	A-4	0	0	80-100	75-100	65-90	55-80	20-30	5-10
	30-60	Loam, sandy loam.	CL-ML, ML	A-4	0	0	80-100	75-100	60-85	50-75	20-30	NP-10
Straw	0-41	Loam.	CL-ML	A-4	0	0	100	100	80-100	60-85	25-30	5-10
	41-60	Loam, silt loam, clay loam.	CL-ML, CL	A-6, A-4	0	0	100	100	80-100	60-85	25-35	5-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
833A: (cont.)												
Eagleton	0-7	Loam.	CL-ML	A-4	0	0	100	100	85-95	60-75	25-30	5-10
	7-37	Stratified sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	0	100	100	75-90	50-75	25-35	5-15
	37-60	Stratified sandy loam to silty clay loam.	CL-ML, CL	A-4, A-6	0	0	100	100	75-95	50-90	25-35	5-15
842A:												
Bullhook	0-3	Clay loam.	CL	A-6	0	0	100	100	90-100	70-80	25-40	10-20
	3-8	Stratified fine sandy loam to clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	70-100	50-80	20-35	5-15
	8-60	Stratified fine sandy loam to clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	70-100	50-80	20-35	5-15
Nobe	0-4	Clay.	CL, CH	A-7	0	0	100	100	90-100	75-90	40-65	20-40
	4-17	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	0	100	100	90-100	75-95	40-65	20-40
	17-60	Stratified loam to clay.	CL, CH	A-7, A-6	0	0	100	100	85-100	65-85	35-60	15-35
883F:												
Perma	0-10	Cobbly loam.	SM, SC-SM, ML, CL-ML	A-4	5-10	10-20	75-95	70-90	65-85	45-75	15-25	NP-10
	10-30	Very gravelly sandy loam, very cobbly loam, very cobbly sandy loam.	GM-GC, GM, SC-SM, SM	A-2, A-4, A-1	0-5	10-35	50-70	40-60	30-50	20-40	20-30	NP-10
	30-60	Extremely gravelly loamy sand, extremely cobbly sandy loam, extremely gravelly loam.	GM, GP, GP-GM	A-1	0-5	15-35	20-40	10-30	5-25	0-15	15-25	NP-5
Whitlash	0-7	Cobbly sandy loam.	SM	A-2, A-1	0	15-30	80-90	70-80	40-55	20-30	20-25	NP-5
	7-17	Very cobbly loam, extremely cobbly loam, extremely cobbly sandy loam.	SM, SC-SM, GM, GM-GC	A-2, A-1, A-4	0	40-65	50-80	45-75	30-65	20-50	20-30	NP-10
	17-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
892F:												
Whitlash--------	0-7	Gravelly sandy loam.	SM	A-2, A-1	0	0-15	70-85	60-75	35-55	15-30	20-25	NP-5
	7-17	Very cobbly loam, extremely channery loam, very gravelly sandy loam.	GM, GM-GC	A-2, A-1	0	20-35	35-65	25-55	20-45	10-35	20-30	NP-10
	17-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Belain----------	0-3	Loam.	ML, CL-ML	A-4	0	0-5	95-100	85-100	65-95	50-75	20-30	NP-10
	3-12	Sandy loam, loam, gravelly loam.	ML, SM, CL-ML, SC-SM	A-4	0	0-5	75-100	65-95	50-80	35-65	20-30	NP-10
	12-18	Gravelly sandy loam, gravelly loam.	ML, SM, CL-ML, SC-SM	A-2, A-4, A-1	0	0-5	65-85	55-75	35-70	20-55	20-30	NP-10
	18-32	Very gravelly loam, very gravelly sandy loam, gravelly loam.	GM, GM-GC, SM, SC-SM	A-1, A-2, A-4	0	0-5	45-75	35-65	25-55	15-40	20-30	NP-10
	32-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Rock outcrop.												
895F:												
Whitlash--------	0-7	Gravelly loam.	SM, SC-SM, ML, CL-ML	A-4	0	0-15	70-85	60-75	50-70	35-60	20-30	NP-10
	7-17	Very cobbly loam, extremely channery loam, very gravelly sandy loam.	GM, GM-GC	A-2, A-1	0	20-35	35-65	25-55	20-45	10-35	20-30	NP-10
	17-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Perma-----------	0-10	Gravelly loam.	SM, SC-SM, GM, GM-GC	A-4	0	0-15	65-85	60-75	50-65	35-50	20-30	NP-10
	10-30	Very gravelly sandy loam, very cobbly loam, very cobbly sandy loam.	GM-GC, GM, SC-SM, SM	A-2, A-4, A-1	0-5	10-35	50-70	40-60	30-50	20-40	20-30	NP-10

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
895F: (cont.)												
Perma (cont.)	30-60	Extremely gravelly loamy sand, extremely cobbly sandy loam, extremely gravelly loam.	GM, GP, GP-GM	A-1	0-5	15-35	20-40	10-30	5-25	0-15	15-25	NP-5
Rock outcrop.												
896F:												
Perma	0-10	Gravelly loam.	SM, SC-SM, GM, GM-GC	A-4	0	0-15	65-85	60-75	50-65	35-50	20-30	NP-10
	10-30	Very gravelly sandy loam, very cobbly loam, very cobbly sandy loam.	GM-GC, GM, SC-SM, SM	A-2, A-4, A-1	0-5	10-35	50-70	40-60	30-50	20-40	20-30	NP-10
	30-60	Extremely gravelly loamy sand, extremely cobbly sandy loam, extremely gravelly loam.	GM, GP, GP-GM	A-1	0-5	15-35	20-40	10-30	5-25	0-15	15-25	NP-5
Whitlash	0-7	Gravelly loam.	SM, SC-SM, ML, CL-ML	A-4	0	0-15	70-85	60-75	50-70	35-60	20-30	NP-10
	7-17	Very cobbly loam, extremely channery loam, very gravelly sandy loam.	GM, GM-GC	A-2, A-1	0	20-35	35-65	25-55	20-45	10-35	20-30	NP-10
	17-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Rock outcrop.												
899F:												
Zahill	0-3	Clay loam.	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	3-28	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	28-60	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
Rock outcrop.												

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
899F: (cont.)												
Whitlash--------	0-7	Gravelly loam.	SM, SC-SM, ML, CL-ML	A-4	0	0-15	70-85	60-75	50-70	35-60	20-30	NP-10
	7-17	Very cobbly loam, extremely channery loam, very gravelly sandy loam.	GM, GM-GC	A-2, A-1	0	20-35	35-65	25-55	20-45	10-35	20-30	NP-10
	17-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
911F:												
Belain----------	0-3	Loam.	ML, CL-ML	A-4	0	0-5	95-100	85-100	65-95	50-75	20-30	NP-10
	3-12	Sandy loam, loam, gravelly loam.	ML, SM, CL-ML, SC-SM	A-4	0	0-5	75-100	65-95	50-80	35-65	20-30	NP-10
	12-18	Gravelly sandy loam, gravelly loam.	ML, SM, CL-ML, SC-SM	A-2, A-4, A-1	0	0-5	65-85	55-75	35-70	20-55	20-30	NP-10
	18-32	Very gravelly loam, very gravelly sandy loam, gravelly loam.	GM, GM-GC, SM, SC-SM	A-1, A-2, A-4	0	0-5	45-75	35-65	25-55	15-40	20-30	NP-10
	32-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Whitlash--------	0-7	Gravelly loam.	SM, SC-SM, ML, CL-ML	A-4	0	0-15	70-85	60-75	50-70	35-60	20-30	NP-10
	7-17	Very cobbly loam, extremely channery loam, very gravelly sandy loam.	GM, GM-GC	A-2, A-1	0	20-35	35-65	25-55	20-45	10-35	20-30	NP-10
	17-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Hedoes----------	0-5	Loam.	ML, SM	A-4	0	0-15	85-100	75-100	65-95	45-75	25-35	NP-5
	5-34	Loam, sandy loam.	ML, SM	A-4	0	0-15	90-100	85-100	65-95	45-75	25-35	NP-5
	34-60	Very gravelly coarse sandy loam, gravelly sandy loam.	GM, SM	A-1	0	0-15	45-65	30-55	15-35	10-20	---	NP

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
915F:												
Belain----------	0-3	Loam.	ML, CL-ML	A-4	0	0-5	95-100	85-100	65-95	50-75	20-30	NP-10
	3-12	Sandy loam, loam, gravelly loam.	ML, SM, CL-ML, SC-SM	A-4	0	0-5	75-100	65-95	50-80	35-65	20-30	NP-10
	12-18	Gravelly sandy loam, gravelly loam.	ML, SM, CL-ML, SC-SM	A-2, A-4, A-1	0	0-5	65-85	55-75	35-70	20-55	20-30	NP-10
	18-32	Very gravelly loam, very gravelly sandy loam, gravelly loam.	GM, GM-GC, SM, SC-SM	A-1, A-2, A-4	0	0-5	45-75	35-65	25-55	15-40	20-30	NP-10
	32-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Whitlash--------	0-7	Gravelly loam.	SM, SC-SM, ML, CL-ML	A-4	0	0-15	70-85	60-75	50-70	35-60	20-30	NP-10
	7-17	Very cobbly loam, extremely channery loam, very gravelly sandy loam.	GM, GM-GC	A-2, A-1	0	20-35	35-65	25-55	20-45	10-35	20-30	NP-10
	17-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Hedoes----------	0-5	Loam.	ML, SM	A-4	0	0-15	85-100	75-100	65-95	45-75	25-35	NP-5
	5-34	Loam, sandy loam.	ML, SM	A-4	0	0-15	90-100	85-100	65-95	45-75	25-35	NP-5
	34-60	Very gravelly coarse sandy loam, gravelly sandy loam.	GM, SM	A-1	0	0-15	45-65	30-55	15-35	10-20	---	NP
951B:												
Kenilworth------	0-8	Fine sandy loam.	ML, SM	A-4	0	0	100	100	70-85	40-55	15-25	NP-5
	8-16	Fine sandy loam, sandy clay loam.	CL-ML, SC-SM	A-4	0	0	100	100	75-90	35-55	20-30	5-10
	16-48	Clay loam, silty clay loam.	CL	A-6	0	0	95-100	90-100	80-100	70-90	30-40	10-20
	48-60	Clay loam, silty clay loam.	CL	A-6	0	0	95-100	90-100	80-100	70-90	30-40	10-20
Fortbenton------	0-6	Fine sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	6-26	Fine sandy loam, sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	26-60	Silty clay loam, clay loam.	CL	A-6	0	0	100	100	80-95	70-95	30-40	10-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
962B:												
Fortbenton	0-6	Loam.	CL-ML	A-4	0	0	100	100	80-90	55-65	25-30	5-10
	6-26	Fine sandy loam, sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	26-60	Silty clay loam, clay loam.	CL	A-6	0	0	100	100	80-95	70-95	30-40	10-15
965B:												
Fortbenton	0-6	Fine sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	6-26	Fine sandy loam, sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	26-60	Silty clay loam, clay loam.	CL	A-6	0	0	100	100	80-95	70-95	30-40	10-15
Chinook	0-4	Fine sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	65-85	30-50	15-25	NP-5
	4-21	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	21-41	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	41-60	Fine sandy loam, loamy fine sand, sandy loam.	SM	A-4, A-2	0	0	80-100	75-100	60-80	25-45	15-25	NP-5
968C:												
Fortbenton	0-6	Fine sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	6-26	Fine sandy loam, sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	26-60	Silty clay loam, clay loam.	CL	A-6	0	0	100	100	80-95	70-95	30-40	10-15
Hillon	0-3	Loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
968D:												
Hillon	0-3	Loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
968D: (cont.)												
Fortbenton	0-6	Fine sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	6-26	Fine sandy loam, sandy loam.	SM	A-4	0	0	100	100	70-85	35-50	15-25	NP-5
	26-60	Silty clay loam, clay loam.	CL	A-6	0	0	100	100	80-95	70-95	30-40	10-15
971F:												
Neldore	0-3	Silty clay.	CL, CH	A-7	0	0-10	95-100	90-100	75-100	70-95	40-55	20-30
	3-10	Clay, silty clay.	CL, CH	A-7	0	0	90-100	85-100	70-95	65-90	40-60	20-40
	10-16	Clay, silty clay.	CL, CH	A-7	0	0-5	85-100	80-100	65-95	60-90	40-60	20-40
	16-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Bascovy	0-5	Silty clay.	CH, CL	A-7	0	0	90-100	75-100	70-95	60-95	40-60	20-35
	5-11	Clay, silty clay.	CH	A-7	0	0	90-100	75-100	70-95	60-95	50-70	25-45
	11-15	Clay, silty clay.	CH	A-7	0	0	90-100	75-100	70-95	60-95	50-70	25-45
	15-26	Clay, silty clay.	CH	A-7	0	0	90-100	75-100	70-95	60-95	50-70	25-45
	26-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
974F:												
Neldore	0-3	Silty clay.	CL, CH	A-7	0	0-10	95-100	90-100	75-100	70-95	40-55	20-30
	3-10	Clay, silty clay.	CL, CH	A-7	0	0	90-100	85-100	70-95	65-90	40-60	20-40
	10-16	Clay, silty clay.	CL, CH	A-7	0	0-5	85-100	80-100	65-95	60-90	40-60	20-40
	16-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	NP
Hillon	0-3	Clay loam.	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	3-29	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
	29-60	Loam, clay loam.	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
DA: Denied access.												
M-W: Miscellaneous water.												
W: Water.												

Physical Properties Of Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
13A:											
McKenzie--------	0-5	40-60	1.00-1.40	0.00-0.06	0.06-0.09	High	2.0-4.0	0.28	0.28	5	4
	5-60	40-60	1.20-1.60	0.00-0.06	0.06-0.09	High	0.0-1.0	0.28	0.28		
16B:											
Degrand---------	0-6	10-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	2.0-3.0	0.37	0.37	3	5
	6-15	20-35	1.40-1.60	0.60-2.00	0.13-0.16	Moderate	1.0-2.0	0.32	0.32		
	15-26	15-30	1.35-1.60	0.60-2.00	0.13-0.16	Low	0.5-1.0	0.32	0.32		
	26-60	0-5	1.50-1.70	6.00-20.00	0.03-0.04	Low	0.0-0.5	0.10	0.15		
22E:											
Hillon----------	0-3	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
22F:											
Hillon----------	0-3	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
24A:											
Hanly-----------	0-7	5-10	1.30-1.50	6.00-20.00	0.08-0.10	Low	0.5-1.0	0.20	0.20	5	2
	7-60	5-10	1.45-1.65	6.00-20.00	0.08-0.11	Low	0.5-1.0	0.17	0.17		
27B:											
Attewan---------	0-6	10-20	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	5
	6-17	20-35	1.40-1.60	0.60-2.00	0.14-0.17	Moderate	1.0-2.0	0.32	0.32		
	17-27	15-30	1.40-1.60	0.60-2.00	0.13-0.15	Moderate	0.5-1.0	0.32	0.32		
	27-60	0-10	1.40-1.60	6.00-20.00	0.02-0.03	Low	0.0-0.5	0.05	0.24		
28A:											
Nishon----------	0-6	27-35	1.25-1.45	0.60-2.00	0.14-0.17	Moderate	0.5-1.0	0.37	0.37	5	6
	6-24	40-60	1.30-1.50	0.06-0.20	0.14-0.17	High	0.5-1.0	0.32	0.32		
	24-60	35-55	1.30-1.50	0.06-0.20	0.14-0.17	High	0.0-0.5	0.32	0.32		
30A:											
Marvan----------	0-4	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-2.0	0.37	0.37	5	4
	4-32	45-60	1.30-1.50	0.01-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	32-60	45-60	1.30-1.50	0.01-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
30C:											
Marvan----------	0-4	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-2.0	0.37	0.37	5	4
	4-32	45-60	1.30-1.50	0.01-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	32-60	45-60	1.30-1.50	0.01-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
31A:											
Ferd------------	0-7	20-27	1.25-1.45	0.20-2.00	0.15-0.19	Low	0.5-1.0	0.43	0.43	5	6
	7-15	35-50	1.30-1.50	0.06-0.20	0.15-0.19	High	0.5-1.0	0.37	0.37		
	15-42	27-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
	42-60	27-40	1.30-1.50	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
32A:											
Kobase----------	0-5	27-40	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37	5	6
	5-12	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	12-40	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	40-60	35-45	1.30-1.55	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
33A:											
Phillips--------	0-10	15-27	1.15-1.35	0.20-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	5
	10-20	35-45	1.20-1.40	0.06-0.20	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	20-48	25-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	48-60	20-35	1.50-1.75	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
34A:											
Dimmick---------	0-21	40-50	1.00-1.40	0.00-0.20	0.14-0.23	High	3.0-8.0	0.28	0.28	5	4
	21-60	40-60	1.30-1.60	0.00-0.06	0.13-0.20	High	1.0-3.0	0.28	0.28		
36A:											
Chinook---------	0-4	5-18	1.25-1.45	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	4-21	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	21-41	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	41-60	5-15	1.40-1.65	2.00-6.00	0.11-0.12	Low	0.0-0.5	0.20	0.20		
36C:											
Chinook---------	0-4	5-18	1.25-1.45	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	4-21	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	21-41	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	41-60	5-15	1.40-1.65	2.00-6.00	0.11-0.12	Low	0.0-0.5	0.20	0.20		
37A:											
Evanston--------	0-7	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	7-18	25-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	18-60	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
51A:											
Wheatbelt-------	0-2	60-85	1.20-1.40	0.01-0.06	0.12-0.15	High	0.5-1.0	0.37	0.37	5	4
	2-16	60-85	1.20-1.40	0.01-0.06	0.12-0.15	High	0.5-1.0	0.37	0.37		
	16-60	60-85	1.20-1.40	0.01-0.06	0.10-0.12	High	0.0-0.5	0.37	0.37		
53D:											
Beaverton-------	0-4	15-27	1.15-1.35	0.60-2.00	0.14-0.16	Low	1.0-3.0	0.17	0.37	2	6
	4-16	25-35	1.50-1.70	0.60-2.00	0.08-0.10	Low	0.5-1.0	0.10	0.32		
	16-60	0-10	1.50-1.75	6.00-20.00	0.03-0.04	Low	0.0-0.5	0.02	0.10		
55A:											
Benz------------	0-2	27-35	1.25-1.45	0.20-0.60	0.13-0.17	Moderate	0.5-2.0	0.43	0.43	5	4L
	2-60	18-35	1.35-1.55	0.06-0.20	0.08-0.13	Moderate	0.0-0.5	0.37	0.37		
60A:											
Havre-----------	0-5	15-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.37	0.37	5	5
	5-60	18-35	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		
62C:											
Weingart--------	0-5	27-40	1.20-1.40	0.06-0.20	0.16-0.19	Moderate	1.0-2.0	0.43	0.43	2	4
	5-10	40-60	1.30-1.55	0.01-0.06	0.12-0.15	High	0.5-1.0	0.37	0.37		
	10-16	35-55	1.30-1.55	0.01-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
	16-22	35-55	1.30-1.55	0.01-0.06	0.08-0.10	High	0.0-0.5	0.37	0.37		
	22-60	---	---	---	---	---	---	---	---		
Weingart, thin surface--------	0-2	40-45	1.20-1.40	0.01-0.06	0.15-0.18	High	1.0-2.0	0.37	0.37	2	4
	2-8	40-60	1.30-1.55	0.01-0.06	0.12-0.15	High	0.5-1.0	0.37	0.37		
	8-16	35-55	1.30-1.55	0.01-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
	16-22	35-55	1.30-1.55	0.01-0.06	0.08-0.10	High	0.0-0.5	0.37	0.37		
	22-60	---	---	---	---	---	---	---	---		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodibility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
72F:											
Zahill----------	0-3	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-28	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	28-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
74B:											
Marias----------	0-6	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-2.0	0.37	0.37	5	4
	6-30	35-60	1.30-1.50	0.01-0.06	0.12-0.16	High	0.5-1.0	0.37	0.37		
	30-60	35-60	1.30-1.55	0.01-0.06	0.12-0.16	High	0.0-0.5	0.37	0.37		
75B:											
Farnuf----------	0-9	15-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	2.0-4.0	0.32	0.32	5	6
	9-18	25-35	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32		
	18-60	20-30	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.32	0.32		
75C:											
Farnuf----------	0-9	15-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	2.0-4.0	0.32	0.32	5	6
	9-18	25-35	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32		
	18-60	20-30	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.32	0.32		
76B:											
Bowery----------	0-24	18-27	1.10-1.25	0.60-2.00	0.20-0.23	Low	4.0-8.0	0.28	0.28	5	6
	24-44	18-27	1.20-1.40	0.60-2.00	0.15-0.19	Low	1.0-2.0	0.37	0.37		
	44-60	10-27	1.40-1.55	0.60-2.00	0.12-0.14	Low	1.0-2.0	0.37	0.37		
76C:											
Bowery----------	0-24	18-27	1.10-1.25	0.60-2.00	0.20-0.23	Low	4.0-8.0	0.28	0.28	5	6
	24-44	18-27	1.20-1.40	0.60-2.00	0.15-0.19	Low	1.0-2.0	0.37	0.37		
	44-60	10-27	1.40-1.55	0.60-2.00	0.12-0.14	Low	1.0-2.0	0.37	0.37		
76D:											
Bowery----------	0-24	18-27	1.10-1.25	0.60-2.00	0.20-0.23	Low	4.0-8.0	0.28	0.28	5	6
	24-44	18-27	1.20-1.40	0.60-2.00	0.15-0.19	Low	1.0-2.0	0.37	0.37		
	44-60	10-27	1.40-1.55	0.60-2.00	0.12-0.14	Low	1.0-2.0	0.37	0.37		
78A:											
Lostriver-------	0-3	40-55	1.40-1.55	0.06-0.20	0.12-0.18	High	0.5-2.0	0.43	0.43	5	4
	3-9	35-55	1.40-1.55	0.06-0.20	0.12-0.18	High	0.5-2.0	0.32	0.32		
	9-60	35-55	1.40-1.55	0.06-0.20	0.11-0.17	High	0.5-2.0	0.32	0.32		
79B:											
Yamacall--------	0-6	18-27	1.20-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.37	0.37	5	4L
	6-40	18-35	1.30-1.50	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	40-60	10-27	1.25-1.45	2.00-6.00	0.14-0.18	Low	0.0-0.5	0.32	0.32		
81A:											
Glendive--------	0-6	5-15	1.30-1.50	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20	5	3
	6-12	5-18	1.30-1.50	2.00-6.00	0.15-0.18	Low	0.5-1.0	0.32	0.32		
	12-60	5-18	1.35-1.60	2.00-6.00	0.10-0.14	Low	0.5-1.0	0.20	0.20		
84A:											
Bullhook--------	0-3	27-40	1.30-1.55	0.60-2.00	0.13-0.17	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-8	18-35	1.30-1.55	0.60-2.00	0.12-0.20	Moderate	0.5-2.0	0.32	0.32		
	8-60	18-35	1.30-1.55	0.60-2.00	0.11-0.17	Moderate	0.5-2.0	0.32	0.32		
90A:											
Harlake---------	0-10	40-55	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.32	0.32	5	4
	10-60	35-60	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
92B:											
Marmarth--------	0-6	20-27	1.10-1.30	0.60-2.00	0.18-0.22	Low	1.0-3.0	0.37	0.37	3	6
	6-13	18-35	1.35-1.60	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.32	0.32		
	13-30	15-30	1.35-1.60	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.32	0.32		
	30-60	---	---	---	---	---	---	---	---		
93D:											
Tally-----------	0-8	10-20	1.25-1.45	2.00-6.00	0.14-0.16	Low	1.0-3.0	0.17	0.17	5	3
	8-31	5-18	1.35-1.60	2.00-6.00	0.13-0.15	Low	1.0-2.0	0.20	0.20		
	31-60	5-18	1.40-1.65	2.00-6.00	0.11-0.13	Low	0.5-1.0	0.20	0.20		
96B:											
Fortbenton------	0-6	5-18	1.40-1.60	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.32	0.32	5	3
	6-26	5-18	1.45-1.65	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.32	0.32		
	26-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
96C:											
Fortbenton------	0-6	5-18	1.40-1.60	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.32	0.32	5	3
	6-26	5-18	1.45-1.65	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.32	0.32		
	26-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
98B:											
Kremlin---------	0-6	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	6-19	18-30	1.25-1.45	0.60-2.00	0.16-0.20	Moderate	1.0-2.0	0.37	0.37		
	19-31	18-30	1.30-1.50	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	31-60	10-25	1.30-1.55	0.60-2.00	0.14-0.18	Low	0.0-0.5	0.37	0.37		
99A:											
Thibadeau-------	0-2	27-40	1.30-1.55	0.60-2.00	0.13-0.17	Moderate	0.5-2.0	0.32	0.32	5	4L
	2-14	18-35	1.30-1.55	0.06-0.20	0.11-0.17	Moderate	0.5-2.0	0.28	0.28		
	14-60	18-35	1.30-1.55	0.06-0.20	0.11-0.17	Moderate	0.5-2.0	0.28	0.28		
110D:											
Laceycreek------	0-23	15-24	1.10-1.30	0.60-2.00	0.17-0.20	Low	4.0-8.0	0.28	0.28	5	6
	23-30	24-35	1.20-1.40	0.60-2.00	0.16-0.19	Moderate	1.0-3.0	0.37	0.37		
	30-42	20-35	1.30-1.50	0.60-2.00	0.15-0.18	Moderate	1.0-3.0	0.32	0.32		
	42-60	5-20	1.35-1.55	2.00-6.00	0.12-0.16	Low	0.5-1.0	0.37	0.37		
115B:											
Thoeny----------	0-6	15-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-2.0	0.49	0.49	5	6
	6-14	35-50	1.30-1.50	0.00-0.06	0.12-0.14	High	0.5-1.0	0.37	0.37		
	14-27	35-50	1.30-1.50	0.00-0.06	0.12-0.14	Moderate	0.5-1.0	0.43	0.43		
	27-60	35-50	1.30-1.50	0.00-0.06	0.10-0.12	Moderate	0.0-0.5	0.43	0.43		
Elloam----------	0-4	20-27	1.25-1.40	0.60-2.00	0.12-0.18	Moderate	1.0-2.0	0.43	0.43	5	6
	4-13	35-55	1.40-1.60	0.06-0.20	0.10-0.14	High	0.5-1.0	0.43	0.43		
	13-18	30-45	1.40-1.60	0.00-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
	18-60	25-40	1.40-1.65	0.00-0.06	0.08-0.12	Moderate	0.0-0.5	0.43	0.43		
171C:											
Delpoint--------	0-5	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	4L
	5-14	18-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	14-34	18-35	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	34-60	---	---	---	---	---	---	---	---		
Cabbart---------	0-6	18-27	1.20-1.40	0.60-2.00	0.17-0.21	Low	1.0-2.0	0.37	0.37	2	4L
	6-15	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	15-18	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	18-60	---	---	---	---	---	---	---	---		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
172C:											
Delpoint, calcareous	0-5	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	4L
	5-14	18-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	14-34	18-35	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	34-60	---	---	---	---	---	---	---	---		
Delpoint	0-5	20-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	6
	5-14	18-35	1.30-1.50	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.37	0.37		
	14-34	18-35	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
	34-60	---	---	---	---	---	---	---	---		
182F:											
Garlet	0-4	10-25	1.20-1.40	0.60-2.00	0.12-0.15	Low	1.0-4.0	0.20	0.37	3	5
	4-16	10-25	1.45-1.70	0.60-2.00	0.08-0.09	Low	1.0-2.0	0.10	0.37		
	16-28	10-25	1.45-1.70	0.60-2.00	0.07-0.08	Low	0.5-1.0	0.10	0.37		
	28-60	5-25	1.45-1.70	0.60-2.00	0.06-0.07	Low	0.0-0.5	0.10	0.37		
Elkner	0-6	5-10	1.20-1.40	2.00-6.00	0.13-0.15	Low	3.0-5.0	0.20	0.20	5	3
	6-16	5-10	1.35-1.60	2.00-6.00	0.10-0.12	Low	1.0-2.0	0.10	0.15		
	16-36	5-10	1.40-1.65	2.00-6.00	0.07-0.08	Low	0.5-1.0	0.05	0.05		
	36-60	0-5	1.40-1.65	6.00-20.00	0.04-0.05	Low	0.0-0.5	0.02	0.05		
191F:											
Winkler	0-7	5-15	1.20-1.40	2.00-6.00	0.09-0.12	Low	2.0-4.0	0.15	0.28	3	3
	7-15	5-15	1.40-1.60	2.00-6.00	0.05-0.06	Low	0.5-1.0	0.05	0.20		
	15-33	5-15	1.40-1.60	2.00-6.00	0.04-0.05	Low	0.0-0.5	0.05	0.17		
	33-60	5-15	1.40-1.65	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.02	0.17		
Ambrant	0-6	5-15	1.20-1.40	2.00-6.00	0.10-0.13	Low	3.0-5.0	0.17	0.17	5	3
	6-18	5-15	1.35-1.55	2.00-6.00	0.08-0.10	Low	0.5-1.0	0.15	0.24		
	18-33	5-18	1.35-1.55	2.00-6.00	0.08-0.10	Low	0.0-0.5	0.15	0.24		
	33-60	0-5	1.30-1.50	6.00-20.00	0.03-0.05	Low	0.0-0.5	0.10	0.24		
Winkler, dry	0-7	5-15	1.20-1.40	2.00-6.00	0.09-0.12	Low	2.0-4.0	0.15	0.28	3	3
	7-15	5-15	1.40-1.60	2.00-6.00	0.05-0.06	Low	0.5-1.0	0.05	0.20		
	15-33	5-15	1.40-1.60	2.00-6.00	0.04-0.05	Low	0.0-0.5	0.05	0.17		
	33-60	5-15	1.40-1.65	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.02	0.17		
200F:											
Badland.											
203F:											
Cabba	0-3	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	2	4L
	3-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	15-60	---	---	---	---	---	---	---	---		
Rock outcrop.											
204F:											
Cabba	0-3	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	2	4L
	3-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	15-60	---	---	---	---	---	---	---	---		
Zahill	0-3	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	3-28	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	28-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
205F:											
Cabba	0-3	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	2	4L
	3-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	15-60	---	---	---	---	---	---	---	---		
Macar	0-4	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	4-12	18-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.32	0.32		
	12-37	18-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.32	0.32		
	37-60	15-30	1.30-1.60	0.60-2.00	0.13-0.16	Moderate	0.0-0.5	0.32	0.32		
211F:											
Cabbart	0-6	18-27	1.20-1.40	0.60-2.00	0.17-0.21	Low	1.0-2.0	0.37	0.37	2	4L
	6-15	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	15-18	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	18-60	---	---	---	---	---	---	---	---		
Rock outcrop.											
212F:											
Cabbart	0-6	18-27	1.20-1.40	0.60-2.00	0.17-0.21	Low	1.0-2.0	0.37	0.37	2	4L
	6-15	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	15-18	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	18-60	---	---	---	---	---	---	---	---		
Hillon	0-3	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
213E:											
Cabbart	0-6	18-27	1.20-1.40	0.60-2.00	0.17-0.21	Low	1.0-2.0	0.37	0.37	2	4L
	6-15	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	15-18	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	18-60	---	---	---	---	---	---	---	---		
Yawdim	0-2	40-50	1.10-1.30	0.06-0.20	0.15-0.18	High	0.5-1.0	0.32	0.32	1	4
	2-15	35-50	1.20-1.40	0.06-0.20	0.15-0.18	High	0.0-0.5	0.32	0.32		
	15-60	---	---	---	---	---	---	---	---		
221D:											
Hillon	0-3	27-35	1.20-1.40	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Kevin	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-47	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	47-60	27-35	1.60-1.80	0.06-0.20	0.12-0.15	Moderate	0.0-0.5	0.37	0.37		
224D:											
Hillon	0-3	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Joplin	0-5	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	5-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-32	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
241A:											
Hanly-----------	0-7	5-10	1.30-1.50	6.00-20.00	0.08-0.10	Low	0.5-1.0	0.20	0.20	5	2
	7-60	5-10	1.45-1.65	6.00-20.00	0.08-0.11	Low	0.5-1.0	0.17	0.17		
251D:											
Bascovy---------	0-5	40-60	1.20-1.40	0.00-0.06	0.14-0.18	High	1.0-2.0	0.37	0.37	2	4
	5-11	40-60	1.30-1.50	0.00-0.06	0.14-0.18	High	0.5-1.0	0.37	0.37		
	11-15	40-60	1.30-1.50	0.00-0.06	0.14-0.17	High	0.5-1.0	0.37	0.37		
	15-26	40-60	1.30-1.50	0.00-0.06	0.13-0.16	High	0.0-0.5	0.37	0.37		
	26-60	---	---	---	---	---	---	---	---		
Neldore---------	0-3	40-50	1.20-1.40	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32	1	4
	3-10	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.5-1.0	0.32	0.32		
	10-16	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.0-0.5	0.32	0.32		
	16-60	---	---	---	---	---	---	---	---		
262A:											
Absher----------	0-2	40-55	1.20-1.40	0.00-0.06	0.10-0.13	High	1.0-2.0	0.37	0.37	5	4
	2-12	35-60	1.35-1.60	0.00-0.06	0.08-0.10	High	0.5-1.0	0.37	0.37		
	12-60	35-50	1.30-1.55	0.00-0.06	0.05-0.07	High	0.0-0.5	0.43	0.43		
Gerdrum---------	0-3	27-40	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.43	0.43	5	6
	3-19	35-55	1.30-1.55	0.00-0.06	0.10-0.13	High	0.5-1.0	0.37	0.37		
	19-60	30-50	1.30-1.55	0.00-0.06	0.08-0.10	High	0.0-0.5	0.43	0.43		
272C:											
Attewan---------	0-6	10-20	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	5
	6-17	20-35	1.40-1.60	0.60-2.00	0.14-0.17	Moderate	1.0-2.0	0.32	0.32		
	17-27	15-30	1.40-1.60	0.60-2.00	0.13-0.15	Moderate	0.5-1.0	0.32	0.32		
	27-60	0-10	1.40-1.60	6.00-20.00	0.02-0.03	Low	0.0-0.5	0.05	0.24		
Tinsley---------	0-7	5-10	1.30-1.50	2.00-6.00	0.08-0.11	Low	0.7-2.0	0.10	0.20	2	3
	7-60	0-10	1.45-1.65	6.00-20.00	0.01-0.02	Low	0.0-0.5	0.05	0.17		
304A:											
Marvan----------	0-4	40-60	1.25-1.45	0.06-0.20	0.11-0.15	High	0.5-1.0	0.37	0.37	5	4
	4-13	45-60	1.30-1.50	0.00-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	13-60	45-60	1.30-1.50	0.00-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
Nobe------------	0-4	40-50	1.30-1.50	0.01-0.06	0.13-0.16	High	0.5-2.0	0.43	0.43	5	4
	4-17	35-60	1.30-1.50	0.01-0.06	0.06-0.07	High	0.5-1.0	0.43	0.43		
	17-60	35-60	1.30-1.55	0.01-0.06	0.06-0.07	High	0.0-0.5	0.43	0.43		
309A:											
Marvan, saline--	0-4	40-60	1.25-1.45	0.06-0.20	0.11-0.15	High	0.5-1.0	0.37	0.37	5	4
	4-13	45-60	1.30-1.50	0.00-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	13-60	45-60	1.30-1.50	0.00-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
Marvan----------	0-4	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-2.0	0.37	0.37	5	4
	4-32	45-60	1.30-1.50	0.01-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	32-60	45-60	1.30-1.50	0.01-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
311B:											
Ferd------------	0-7	20-27	1.25-1.45	0.20-2.00	0.15-0.19	Low	0.5-1.0	0.43	0.43	5	6
	7-15	35-50	1.30-1.50	0.06-0.20	0.15-0.19	High	0.5-1.0	0.37	0.37		
	15-42	27-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
	42-60	27-40	1.30-1.50	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
311B: (cont.)											
Creed-----------	0-7	20-27	1.15-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.43	0.43	5	6
	7-16	35-55	1.30-1.55	0.06-0.20	0.10-0.14	High	1.0-2.0	0.32	0.32		
	16-29	27-45	1.30-1.55	0.06-0.20	0.08-0.12	Moderate	0.0-0.5	0.37	0.37		
	29-60	25-35	1.30-1.55	0.06-0.20	0.08-0.12	Moderate	0.0-0.5	0.37	0.37		
Gerdrum---------	0-3	27-40	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.43	0.43	5	6
	3-19	35-55	1.30-1.55	0.00-0.06	0.10-0.13	High	0.5-1.0	0.37	0.37		
	19-60	30-50	1.30-1.55	0.00-0.06	0.08-0.10	High	0.0-0.5	0.43	0.43		
321A:											
Kobase----------	0-5	27-40	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37	5	4L
	5-40	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	40-60	35-45	1.30-1.55	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
331B:											
Phillips--------	0-10	15-27	1.15-1.35	0.20-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	5
	10-20	35-45	1.20-1.40	0.06-0.20	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	20-40	25-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	40-60	20-35	1.50-1.75	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
Elloam----------	0-4	20-27	1.25-1.40	0.60-2.00	0.12-0.18	Moderate	1.0-2.0	0.43	0.43	5	6
	4-13	35-55	1.40-1.60	0.06-0.20	0.10-0.14	High	0.5-1.0	0.43	0.43		
	13-18	30-45	1.40-1.60	0.00-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
	18-60	25-40	1.40-1.65	0.00-0.06	0.08-0.12	Moderate	0.0-0.5	0.43	0.43		
334B:											
Phillips--------	0-10	15-27	1.15-1.35	0.20-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	5
	10-20	35-45	1.20-1.40	0.06-0.20	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	20-48	25-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	48-60	20-35	1.50-1.75	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
Kevin-----------	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-47	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	47-60	27-35	1.60-1.80	0.06-0.20	0.12-0.15	Moderate	0.0-0.5	0.37	0.37		
362C:											
Chinook---------	0-4	5-18	1.25-1.45	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	4-21	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	21-41	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	41-60	5-15	1.40-1.65	2.00-6.00	0.11-0.12	Low	0.0-0.5	0.20	0.20		
Yetull----------	0-8	0-10	1.35-1.55	6.00-20.00	0.05-0.08	Low	1.0-2.0	0.20	0.20	5	2
	8-60	0-10	1.45-1.65	6.00-20.00	0.05-0.07	Low	0.0-0.5	0.17	0.17		
375B:											
Evanston--------	0-7	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	7-18	25-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	18-60	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Lonna-----------	0-6	18-27	1.10-1.30	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	4L
	6-11	18-35	1.25-1.45	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	11-52	18-35	1.25-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	52-60	10-35	1.25-1.50	0.60-2.00	0.12-0.16	Moderate	0.0-0.5	0.37	0.37		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
381A:											
Ethridge	0-7	27-35	1.15-1.35	0.20-0.60	0.16-0.20	Moderate	1.0-3.0	0.37	0.37	5	6
	7-15	35-45	1.30-1.50	0.06-0.20	0.15-0.19	High	1.0-2.0	0.32	0.32		
	15-33	30-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	33-60	25-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
400F:											
Rubble land.											
Rock outcrop.											
402A:											
Gerdrum	0-3	27-40	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.43	0.43	5	6
	3-19	35-55	1.30-1.55	0.00-0.06	0.10-0.13	High	0.5-1.0	0.37	0.37		
	19-60	30-50	1.30-1.55	0.00-0.06	0.08-0.10	High	0.0-0.5	0.43	0.43		
Absher	0-2	40-55	1.20-1.40	0.00-0.06	0.10-0.13	High	1.0-2.0	0.37	0.37	5	4
	2-8	35-60	1.35-1.60	0.00-0.06	0.08-0.10	High	0.5-1.0	0.37	0.37		
	8-60	35-50	1.30-1.55	0.00-0.06	0.05-0.07	High	0.0-0.5	0.43	0.43		
Creed	0-7	20-27	1.15-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.43	0.43	5	6
	7-16	35-55	1.30-1.55	0.06-0.20	0.10-0.14	High	1.0-2.0	0.32	0.32		
	16-29	27-45	1.30-1.55	0.06-0.20	0.08-0.12	Moderate	0.0-0.5	0.37	0.37		
	29-60	25-35	1.30-1.55	0.06-0.20	0.08-0.12	Moderate	0.0-0.5	0.37	0.37		
421C:											
Joplin	0-5	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	5-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-32	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
Hillon	0-3	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
441C:											
Kevin	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-47	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	47-60	27-35	1.60-1.80	0.06-0.20	0.12-0.15	Moderate	0.0-0.5	0.37	0.37		
Hillon	0-3	27-35	1.20-1.40	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
442C:											
Kevin	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-47	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	47-60	27-35	1.60-1.80	0.06-0.20	0.12-0.15	Moderate	0.0-0.5	0.37	0.37		
Elloam	0-4	20-27	1.25-1.40	0.60-2.00	0.12-0.18	Moderate	1.0-2.0	0.43	0.43	5	6
	4-13	35-55	1.40-1.60	0.06-0.20	0.10-0.14	High	0.5-1.0	0.43	0.43		
	13-18	30-45	1.40-1.60	0.00-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
	18-60	25-40	1.40-1.65	0.00-0.06	0.08-0.12	Moderate	0.0-0.5	0.43	0.43		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
501B:											
Telstad	0-6	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	6-12	25-35	1.25-1.45	0.20-0.60	0.16-0.19	Moderate	1.0-2.0	0.37	0.37		
	12-40	20-32	1.30-1.50	0.20-0.60	0.15-0.18	Moderate	0.5-1.0	0.37	0.37		
	40-60	20-32	1.50-1.75	0.06-0.20	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
Hillon	0-3	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
503B:											
Telstad	0-6	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	6-12	25-35	1.25-1.45	0.20-0.60	0.16-0.19	Moderate	1.0-2.0	0.37	0.37		
	12-40	20-32	1.30-1.50	0.20-0.60	0.15-0.18	Moderate	0.5-1.0	0.37	0.37		
	40-60	20-32	1.50-1.75	0.06-0.20	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
Joplin	0-5	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	5-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-32	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
503C:											
Telstad	0-6	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	6-12	25-35	1.25-1.45	0.20-0.60	0.16-0.19	Moderate	1.0-2.0	0.37	0.37		
	12-40	20-32	1.30-1.50	0.20-0.60	0.15-0.18	Moderate	0.5-1.0	0.37	0.37		
	40-60	20-32	1.50-1.75	0.06-0.20	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
Joplin	0-5	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	5-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-32	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
522A:											
Elloam	0-4	20-27	1.25-1.40	0.60-2.00	0.12-0.18	Moderate	1.0-2.0	0.43	0.43	5	6
	4-13	35-55	1.40-1.60	0.06-0.20	0.10-0.14	High	0.5-1.0	0.43	0.43		
	13-18	30-45	1.40-1.60	0.00-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
	18-60	25-40	1.40-1.65	0.00-0.06	0.08-0.12	Moderate	0.0-0.5	0.43	0.43		
Absher	0-2	40-55	1.20-1.40	0.00-0.06	0.10-0.13	High	1.0-2.0	0.37	0.37	5	4
	2-8	35-60	1.35-1.60	0.00-0.06	0.08-0.10	High	0.5-1.0	0.37	0.37		
	8-60	35-50	1.30-1.55	0.00-0.06	0.05-0.07	High	0.0-0.5	0.43	0.43		
530F:											
Warwood	0-4	20-27	1.20-1.40	0.60-2.00	0.14-0.18	Low	1.0-2.0	0.37	0.37	5	6
	4-15	15-30	1.40-1.60	0.60-2.00	0.12-0.16	Low	0.5-1.0	0.32	0.32		
	15-20	20-35	1.40-1.60	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.32	0.32		
	20-45	27-35	1.35-1.55	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.32	0.32		
	45-60	20-35	1.40-1.60	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.32	0.32		
561B:											
Scobey	0-6	27-35	1.15-1.35	0.60-2.00	0.16-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-14	35-45	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.32	0.32		
	14-60	30-40	1.35-1.65	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.37	0.37		
Kevin	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-47	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	47-60	27-35	1.60-1.80	0.06-0.20	0.12-0.15	Moderate	0.0-0.5	0.37	0.37		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
561C:											
Scobey----------	0-6	27-35	1.15-1.35	0.60-2.00	0.16-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-14	35-45	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.32	0.32		
	14-60	30-40	1.35-1.65	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.37	0.37		
Kevin-----------	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-47	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	47-60	27-35	1.60-1.80	0.06-0.20	0.12-0.15	Moderate	0.0-0.5	0.37	0.37		
564B:											
Scobey----------	0-6	27-35	1.15-1.35	0.60-2.00	0.16-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-14	35-45	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.32	0.32		
	14-60	30-40	1.35-1.65	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.37	0.37		
Hillon----------	0-3	27-35	1.20-1.40	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
571D:											
Chinook---------	0-4	5-18	1.25-1.45	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	4-21	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	21-41	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	41-60	5-15	1.40-1.65	2.00-6.00	0.11-0.12	Low	0.0-0.5	0.20	0.20		
Cozberg---------	0-7	10-20	1.20-1.40	2.00-6.00	0.13-0.16	Low	2.0-4.0	0.20	0.20	3	3
	7-17	10-18	1.30-1.55	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20		
	17-24	10-18	1.45-1.65	2.00-6.00	0.10-0.12	Low	0.0-0.5	0.17	0.17		
	24-60	0-10	1.45-1.65	6.00-20.00	0.04-0.06	Low	0.0-0.5	0.17	0.17		
Yetull----------	0-8	0-10	1.30-1.50	2.00-6.00	0.11-0.15	Low	1.0-2.0	0.24	0.24	5	3
	8-60	0-10	1.45-1.65	6.00-20.00	0.05-0.07	Low	0.0-0.5	0.17	0.17		
573B:											
Cozberg---------	0-7	10-20	1.20-1.40	2.00-6.00	0.13-0.16	Low	2.0-4.0	0.20	0.20	3	3
	7-17	10-18	1.30-1.55	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20		
	17-24	10-18	1.45-1.65	2.00-6.00	0.10-0.12	Low	0.0-0.5	0.17	0.17		
	24-60	0-10	1.45-1.65	6.00-20.00	0.04-0.06	Low	0.0-0.5	0.17	0.17		
Chinook---------	0-4	5-18	1.25-1.45	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	4-21	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	21-41	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	41-60	5-15	1.40-1.65	2.00-6.00	0.11-0.12	Low	0.0-0.5	0.20	0.20		
603A:											
Havre-----------	0-5	27-40	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	0.5-2.0	0.32	0.32	5	4L
	5-60	18-35	1.40-1.60	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		
Harlake---------	0-10	27-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37	5	4L
	10-60	35-60	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
604A:											
Havre-----------	0-5	15-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.37	0.37	5	5
	5-60	18-35	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		
Glendive--------	0-6	5-15	1.40-1.60	2.00-6.00	0.10-0.13	Low	0.5-2.0	0.20	0.20	5	3
	6-12	5-18	1.35-1.60	2.00-6.00	0.15-0.19	Low	0.5-1.0	0.32	0.32		
	12-60	5-18	1.35-1.60	2.00-6.00	0.10-0.13	Low	0.5-1.0	0.20	0.20		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
611B:											
Hingham---------	0-7	7-18	1.15-1.35	0.60-2.00	0.15-0.19	Low	1.0-2.0	0.37	0.37	5	5
	7-14	5-18	1.10-1.40	0.60-2.00	0.15-0.19	Low	0.5-1.0	0.37	0.37		
	14-60	5-18	1.20-1.50	0.60-2.00	0.15-0.19	Low	0.0-0.5	0.37	0.37		
Lonna-----------	0-6	18-27	1.10-1.30	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	4L
	6-11	18-35	1.25-1.45	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	11-52	18-35	1.25-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	52-60	10-35	1.25-1.50	0.60-2.00	0.12-0.16	Moderate	0.0-0.5	0.37	0.37		
661C:											
Twilight--------	0-6	5-18	1.15-1.40	2.00-6.00	0.13-0.16	Low	1.0-3.0	0.20	0.20	3	3
	6-14	5-18	1.25-1.50	2.00-6.00	0.13-0.16	Low	0.5-1.0	0.20	0.20		
	14-29	5-18	1.25-1.50	2.00-6.00	0.12-0.15	Low	0.0-0.5	0.20	0.20		
	29-60	---	---	---	---	---	---	---	---		
Blacksheep------	0-6	5-15	1.20-1.40	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	2	3
	6-17	5-15	1.30-1.55	2.00-6.00	0.13-0.16	Low	0.5-1.0	0.20	0.20		
	17-60	---	---	---	---	---	---	---	---		
671B:											
Bearpaw---------	0-5	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	5-13	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	13-41	35-45	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	41-60	30-45	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
Vida------------	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-8	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	8-22	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	22-60	25-35	1.50-1.75	0.06-0.20	0.10-0.14	Moderate	0.0-0.5	0.37	0.37		
671C:											
Bearpaw---------	0-5	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	5-13	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	13-41	35-45	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	41-60	30-45	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
Vida------------	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-8	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	8-22	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	22-60	25-35	1.50-1.75	0.06-0.20	0.10-0.14	Moderate	0.0-0.5	0.37	0.37		
671D:											
Bearpaw---------	0-5	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	5-13	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	13-41	35-45	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	41-60	30-45	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
Vida------------	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-8	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	8-22	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	22-60	25-35	1.50-1.75	0.06-0.20	0.10-0.14	Moderate	0.0-0.5	0.37	0.37		
674B:											
Bearpaw---------	0-5	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	5-13	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	13-41	35-45	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	41-60	30-45	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
674B: (cont.)											
Waltham---------	0-2	27-40	1.25-1.40	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.43	0.43	5	4
	2-10	45-60	1.40-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.43	0.43		
	10-17	35-45	1.40-1.50	0.01-0.06	0.12-0.16	Moderate	0.0-0.5	0.43	0.43		
	17-60	27-40	1.60-1.80	0.01-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
696C:											
Vida------------	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-8	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	8-22	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	22-60	25-35	1.50-1.75	0.06-0.20	0.10-0.14	Moderate	0.0-0.5	0.37	0.37		
Zahill----------	0-3	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-28	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	28-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Bearpaw---------	0-5	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	5-13	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	13-41	35-45	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	41-60	30-45	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
701D:											
Yetull----------	0-8	0-10	1.30-1.50	2.00-6.00	0.11-0.15	Low	1.0-2.0	0.24	0.24	5	3
	8-60	0-10	1.45-1.65	6.00-20.00	0.05-0.07	Low	0.0-1.0	0.17	0.17		
Busby-----------	0-4	10-18	1.30-1.50	2.00-6.00	0.12-0.16	Low	1.0-2.0	0.20	0.20	5	3
	4-14	10-18	1.40-1.60	2.00-6.00	0.12-0.16	Low	0.5-1.0	0.32	0.32		
	14-41	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.20	0.20		
	41-60	3-18	1.50-1.70	6.00-20.00	0.08-0.10	Low	0.0-0.5	0.20	0.20		
721E:											
Zahill----------	0-3	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-28	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	28-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Vida------------	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-8	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	8-22	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	22-60	25-35	1.50-1.75	0.06-0.20	0.10-0.14	Moderate	0.0-0.5	0.37	0.37		
722D:											
Zahill----------	0-3	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-28	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	28-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Vida------------	0-5	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-8	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	8-22	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	22-60	25-35	1.50-1.75	0.06-0.20	0.10-0.14	Moderate	0.0-0.5	0.37	0.37		
725F:											
Zahill----------	0-3	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-28	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	28-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Rock outcrop.											

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
729F:											
Zahill----------	0-3	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-28	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	28-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Obrien----------	0-21	27-35	1.10-1.35	0.60-2.00	0.20-0.24	Moderate	4.0-8.0	0.28	0.28	5	6
	21-37	18-35	1.30-1.50	0.06-0.20	0.13-0.17	Moderate	1.0-2.0	0.37	0.37		
	37-60	18-35	1.60-1.80	0.06-0.20	0.10-0.13	Moderate	0.5-1.0	0.37	0.37		
732C:											
Yetull----------	0-8	0-10	1.35-1.55	6.00-20.00	0.05-0.08	Low	1.0-2.0	0.20	0.20	5	2
	8-60	0-10	1.45-1.65	6.00-20.00	0.05-0.07	Low	0.0-0.5	0.17	0.17		
Lonesome--------	0-5	5-15	1.45-1.65	6.00-20.00	0.08-0.10	Low	0.5-1.0	0.28	0.28	5	2
	5-15	5-15	1.50-1.70	6.00-20.00	0.08-0.10	Low	0.5-1.0	0.24	0.24		
	15-30	5-15	1.50-1.70	6.00-20.00	0.08-0.10	Low	0.0-0.5	0.24	0.24		
	30-60	20-35	1.30-1.50	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.37	0.37		
761D:											
Hedoes----------	0-5	10-15	1.05-1.25	0.60-2.00	0.16-0.20	Low	5.0-10	0.28	0.28	5	5
	5-34	5-15	1.30-1.50	0.60-2.00	0.14-0.17	Low	4.0-8.0	0.28	0.28		
	34-60	0-10	1.40-1.60	2.00-6.00	0.06-0.07	Low	0.0-0.5	0.10	0.24		
Belain----------	0-3	15-20	1.10-1.30	0.60-2.00	0.16-0.20	Low	2.0-4.0	0.32	0.32	2	5
	3-12	10-18	1.35-1.55	0.60-2.00	0.12-0.15	Low	1.0-2.0	0.24	0.32		
	12-18	10-18	1.35-1.55	0.60-2.00	0.11-0.13	Low	0.5-1.0	0.20	0.37		
	18-32	10-18	1.35-1.55	2.00-6.00	0.07-0.08	Low	0.0-0.5	0.17	0.43		
	32-60	---	---	---	---	---	---	---	---		
761F:											
Hedoes----------	0-5	10-15	1.05-1.25	0.60-2.00	0.16-0.20	Low	5.0-10	0.32	0.32	5	5
	5-34	5-15	1.30-1.50	0.60-2.00	0.14-0.17	Low	4.0-8.0	0.28	0.28		
	34-60	0-10	1.40-1.60	2.00-6.00	0.06-0.07	Low	0.0-0.5	0.10	0.24		
Belain----------	0-3	15-20	1.10-1.30	0.60-2.00	0.16-0.20	Low	2.0-4.0	0.37	0.37	2	5
	3-12	10-18	1.35-1.55	0.60-2.00	0.12-0.15	Low	1.0-2.0	0.24	0.32		
	12-18	10-18	1.35-1.55	0.60-2.00	0.11-0.13	Low	0.5-1.0	0.20	0.37		
	18-32	10-18	1.35-1.55	2.00-6.00	0.07-0.08	Low	0.0-0.5	0.17	0.43		
	32-60	---	---	---	---	---	---	---	---		
763E:											
Laceycreek------	0-23	15-24	1.10-1.30	0.60-2.00	0.17-0.20	Low	4.0-8.0	0.28	0.28	5	6
	23-30	24-35	1.20-1.40	0.60-2.00	0.16-0.19	Moderate	1.0-3.0	0.37	0.28		
	30-42	20-35	1.30-1.50	0.60-2.00	0.15-0.18	Moderate	1.0-3.0	0.32	0.32		
	42-60	5-20	1.35-1.55	2.00-6.00	0.12-0.16	Low	0.5-1.0	0.37	0.37		
791C:											
Yamacall--------	0-6	18-27	1.20-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.37	0.37	5	4L
	6-40	18-35	1.30-1.50	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	40-60	10-27	1.25-1.45	2.00-6.00	0.14-0.18	Low	0.0-0.5	0.32	0.32		
Hillon----------	0-3	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
795C:											
Yamacall--------	0-6	27-35	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32	5	4L
	6-40	18-35	1.30-1.50	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	40-60	10-27	1.25-1.45	2.00-6.00	0.14-0.18	Low	0.0-0.5	0.32	0.32		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
795C: (cont.)											
Benz	0-2	27-35	1.25-1.45	0.20-0.60	0.13-0.17	Moderate	0.5-2.0	0.37	0.37	5	4L
	2-60	18-35	1.35-1.55	0.06-0.20	0.08-0.13	Moderate	0.0-0.5	0.37	0.37		
799C:											
Yamacall	0-6	27-35	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32	5	4L
	6-40	18-35	1.30-1.50	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	40-60	10-27	1.25-1.45	2.00-6.00	0.14-0.18	Low	0.0-0.5	0.32	0.32		
801B:											
Williams	0-4	15-27	1.15-1.35	0.60-2.00	0.19-0.21	Low	2.0-5.0	0.37	0.37	5	6
	4-14	24-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	0.37		
	14-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	0.37		
Vida	0-5	15-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	5-8	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	8-22	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	22-60	25-35	1.50-1.75	0.06-0.20	0.10-0.14	Moderate	0.0-0.5	0.37	0.37		
801C:											
Williams	0-4	15-27	1.15-1.35	0.60-2.00	0.19-0.21	Low	2.0-5.0	0.37	0.37	5	6
	4-14	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	0.37		
	14-60	24-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	0.37		
Vida	0-5	15-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	5-8	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	8-22	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	22-60	25-35	1.50-1.75	0.06-0.20	0.10-0.14	Moderate	0.0-0.5	0.37	0.37		
812A:											
Glendive	0-6	5-15	1.30-1.50	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20	5	3
	6-12	5-18	1.30-1.50	2.00-6.00	0.15-0.18	Low	0.5-1.0	0.32	0.32		
	12-60	5-18	1.40-1.60	2.00-6.00	0.12-0.14	Low	0.5-1.0	0.20	0.20		
831A:											
Straw	0-41	20-27	1.10-1.25	0.60-2.00	0.16-0.20	Low	3.0-5.0	0.28	0.28	5	6
	41-60	22-35	1.20-1.40	0.60-2.00	0.16-0.19	Moderate	1.0-3.0	0.37	0.37		
Korchea	0-6	18-27	1.20-1.50	0.60-2.00	0.17-0.21	Low	1.0-3.0	0.37	0.37	5	6
	6-60	18-35	1.30-1.60	0.60-2.00	0.15-0.18	Low	0.5-1.0	0.37	0.37		
832A:											
Nesda	0-13	10-20	1.30-1.50	2.00-6.00	0.06-0.10	Low	2.0-4.0	0.05	0.17	2	3
	13-60	0-10	1.50-1.70	6.00-20.00	0.03-0.05	Low	0.5-1.0	0.02	0.10		
Nesda	0-13	10-20	1.20-1.40	0.60-2.00	0.12-0.16	Low	2.0-4.0	0.15	0.37	2	5
	13-60	0-10	1.55-1.70	6.00-20.00	0.03-0.04	Low	0.5-1.0	0.02	0.10		
833A:											
Enbar	0-23	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	3.0-5.0	0.28	0.28	5	6
	23-30	18-30	1.30-1.50	0.60-2.00	0.14-0.16	Low	1.0-3.0	0.37	0.37		
	30-60	18-27	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.37	0.37		
Straw	0-41	20-27	1.10-1.25	0.60-2.00	0.16-0.20	Low	3.0-5.0	0.28	0.28	5	6
	41-60	22-35	1.20-1.40	0.60-2.00	0.16-0.19	Moderate	1.0-3.0	0.37	0.37		
Eagleton	0-7	18-27	1.10-1.30	0.60-2.00	0.17-0.21	Low	4.0-6.0	0.28	0.28	5	6
	7-37	18-35	1.10-1.30	0.60-2.00	0.16-0.20	Low	3.0-5.0	0.37	0.37		
	37-60	18-35	1.20-1.40	0.60-2.00	0.15-0.19	Low	1.0-2.0	0.37	0.37		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
842A:											
Bullhook--------	0-3	27-40	1.30-1.55	0.60-2.00	0.13-0.17	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-8	18-35	1.30-1.55	0.60-2.00	0.12-0.20	Moderate	0.5-2.0	0.32	0.32		
	8-60	18-35	1.30-1.55	0.60-2.00	0.11-0.17	Moderate	0.5-2.0	0.32	0.32		
Nobe------------	0-4	40-60	1.20-1.40	0.06-0.20	0.11-0.13	High	0.5-2.0	0.43	0.43	5	4
	4-17	35-60	1.40-1.60	0.01-0.06	0.05-0.08	High	0.5-1.0	0.43	0.43		
	17-60	35-60	1.40-1.60	0.01-0.06	0.05-0.08	High	0.0-0.5	0.43	0.43		
883F:											
Perma-----------	0-10	7-20	1.30-1.50	0.60-2.00	0.12-0.14	Low	2.0-4.0	0.17	0.32	2	5
	10-30	7-20	1.40-1.60	0.60-2.00	0.08-0.09	Low	1.0-2.0	0.10	0.37		
	30-60	0-15	1.50-1.70	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.05	0.37		
Whitlash--------	0-7	10-20	1.15-1.35	0.60-2.00	0.07-0.12	Low	2.0-4.0	0.15	0.20	1	3
	7-17	10-27	1.10-1.35	0.60-2.00	0.05-0.10	Low	2.0-4.0	0.10	0.20		
	17-60	---	---	---	---	---	---	---	---		
892F:											
Whitlash--------	0-7	10-20	1.15-1.35	0.60-2.00	0.07-0.12	Low	2.0-4.0	0.15	0.24	1	3
	7-17	10-27	1.10-1.35	0.60-2.00	0.05-0.10	Low	2.0-4.0	0.10	0.37		
	17-60	---	---	---	---	---	---	---	---		
Belain----------	0-3	15-20	1.10-1.30	0.60-2.00	0.16-0.20	Low	2.0-4.0	0.37	0.37	2	5
	3-12	10-18	1.35-1.55	0.60-2.00	0.12-0.15	Low	1.0-2.0	0.24	0.32		
	12-18	10-18	1.35-1.55	0.60-2.00	0.11-0.13	Low	0.5-1.0	0.20	0.37		
	18-32	10-18	1.35-1.55	2.00-6.00	0.07-0.08	Low	0.0-0.5	0.17	0.43		
	32-60	---	---	---	---	---	---	---	---		
Rock outcrop.											
895F:											
Whitlash--------	0-7	10-27	1.10-1.30	0.60-2.00	0.10-0.16	Low	2.0-4.0	0.20	0.37	1	5
	7-17	10-27	1.10-1.35	0.60-2.00	0.05-0.10	Low	2.0-4.0	0.10	0.37		
	17-60	---	---	---	---	---	---	---	---		
Perma-----------	0-10	7-20	1.30-1.50	0.60-2.00	0.12-0.14	Low	2.0-4.0	0.17	0.32	2	5
	10-30	7-20	1.40-1.60	0.60-2.00	0.08-0.09	Low	1.0-2.0	0.10	0.37		
	30-60	0-15	1.50-1.70	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.05	0.37		
Rock outcrop.											
896F:											
Perma-----------	0-10	7-20	1.30-1.50	0.60-2.00	0.12-0.14	Low	2.0-4.0	0.17	0.32	2	5
	10-30	7-20	1.40-1.60	0.60-2.00	0.08-0.09	Low	1.0-2.0	0.10	0.37		
	30-60	0-15	1.50-1.70	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.05	0.37		
Whitlash--------	0-7	10-27	1.10-1.30	0.60-2.00	0.10-0.16	Low	2.0-4.0	0.20	0.37	1	5
	7-17	10-27	1.10-1.35	0.60-2.00	0.05-0.10	Low	2.0-4.0	0.10	0.37		
	17-60	---	---	---	---	---	---	---	---		
Rock outcrop.											
899F:											
Zahill----------	0-3	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-28	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	28-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Rock outcrop.											

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
899F: (cont.)											
Whitlash--------	0-7	10-27	1.10-1.30	0.60-2.00	0.10-0.16	Low	2.0-4.0	0.20	0.37	1	5
	7-17	10-27	1.10-1.35	0.60-2.00	0.05-0.10	Low	2.0-4.0	0.10	0.37		
	17-60	---	---	---	---	---	---	---	---		
911F:											
Belain----------	0-3	15-20	1.10-1.30	0.60-2.00	0.16-0.20	Low	2.0-4.0	0.37	0.37	2	5
	3-12	10-18	1.35-1.55	0.60-2.00	0.12-0.15	Low	1.0-2.0	0.24	0.32		
	12-18	10-18	1.35-1.55	0.60-2.00	0.11-0.13	Low	0.5-1.0	0.20	0.37		
	18-32	10-18	1.35-1.55	2.00-6.00	0.07-0.08	Low	0.0-0.5	0.17	0.43		
	32-60	---	---	---	---	---	---	---	---		
Whitlash--------	0-7	10-27	1.10-1.30	0.60-2.00	0.10-0.16	Low	2.0-4.0	0.20	0.37	1	5
	7-17	10-27	1.10-1.35	0.60-2.00	0.05-0.10	Low	2.0-4.0	0.10	0.37		
	17-60	---	---	---	---	---	---	---	---		
Hedoes----------	0-5	10-15	1.05-1.25	0.60-2.00	0.16-0.20	Low	5.0-10	0.32	0.32	5	5
	5-34	5-15	1.30-1.50	0.60-2.00	0.14-0.17	Low	4.0-8.0	0.28	0.28		
	34-60	0-10	1.40-1.60	2.00-6.00	0.06-0.07	Low	0.0-0.5	0.10	0.24		
915F:											
Belain----------	0-3	15-20	1.10-1.30	0.60-2.00	0.16-0.20	Low	2.0-4.0	0.37	0.37	2	5
	3-12	10-18	1.35-1.55	0.60-2.00	0.12-0.15	Low	1.0-2.0	0.24	0.32		
	12-18	10-18	1.35-1.55	0.60-2.00	0.11-0.13	Low	0.5-1.0	0.20	0.37		
	18-32	10-18	1.35-1.55	2.00-6.00	0.07-0.08	Low	0.0-0.5	0.17	0.43		
	32-60	---	---	---	---	---	---	---	---		
Whitlash--------	0-7	10-27	1.10-1.30	0.60-2.00	0.10-0.16	Low	2.0-4.0	0.20	0.37	1	5
	7-17	10-27	1.10-1.35	0.60-2.00	0.05-0.10	Low	2.0-4.0	0.10	0.37		
	17-60	---	---	---	---	---	---	---	---		
Hedoes----------	0-5	10-15	1.05-1.25	0.60-2.00	0.16-0.20	Low	5.0-10	0.32	0.32	5	5
	5-34	5-15	1.30-1.50	0.60-2.00	0.14-0.17	Low	4.0-8.0	0.28	0.28		
	34-60	0-10	1.40-1.60	2.00-6.00	0.06-0.07	Low	0.0-0.5	0.10	0.24		
951B:											
Kenilworth------	0-8	5-18	1.30-1.50	2.00-6.00	0.12-0.16	Low	1.0-2.0	0.32	0.32	5	3
	8-16	15-30	1.40-1.60	0.60-2.00	0.13-0.17	Low	0.5-1.0	0.37	0.37		
	16-48	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
	48-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
Fortbenton------	0-6	5-18	1.40-1.60	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.32	0.32	5	3
	6-26	5-18	1.45-1.65	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.32	0.32		
	26-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
962B:											
Fortbenton------	0-6	10-20	1.20-1.40	0.60-2.00	0.12-0.15	Low	1.0-2.0	0.43	0.43	5	5
	6-26	5-18	1.45-1.65	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.32	0.32		
	26-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
965B:											
Fortbenton------	0-6	5-18	1.40-1.60	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.32	0.32	5	3
	6-26	5-18	1.45-1.65	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.32	0.32		
	26-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
Chinook---------	0-4	5-18	1.25-1.45	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	4-21	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	21-41	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	41-60	5-15	1.40-1.65	2.00-6.00	0.11-0.12	Low	0.0-0.5	0.20	0.20		

Physical Properties Of Soils--Continued

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodability index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in		Pct				
968C:											
Fortbenton------	0-6	5-18	1.40-1.60	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.32	0.32	5	3
	6-26	5-18	1.45-1.65	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.32	0.32		
	26-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
Hillon----------	0-3	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
968D:											
Hillon----------	0-3	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Fortbenton------	0-6	5-18	1.40-1.60	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.32	0.32	5	3
	6-26	5-18	1.45-1.65	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.32	0.32		
	26-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		
971F:											
Neldore---------	0-3	40-50	1.20-1.40	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32	1	4
	3-10	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.5-1.0	0.32	0.32		
	10-16	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.0-0.5	0.32	0.32		
	16-60	---	---	---	---	---	---	---	---		
Bascovy---------	0-5	40-60	1.20-1.40	0.00-0.06	0.14-0.18	High	1.0-2.0	0.37	0.37	2	4
	5-11	40-60	1.30-1.50	0.00-0.06	0.14-0.18	High	0.5-1.0	0.37	0.37		
	11-15	40-60	1.30-1.50	0.00-0.06	0.14-0.17	High	0.5-1.0	0.37	0.37		
	15-26	40-60	1.30-1.50	0.00-0.06	0.13-0.16	High	0.0-0.5	0.37	0.37		
	26-60	---	---	---	---	---	---	---	---		
974F:											
Neldore---------	0-3	40-50	1.20-1.40	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32	1	4
	3-10	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.5-1.0	0.32	0.32		
	10-16	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.0-0.5	0.32	0.32		
	16-60	---	---	---	---	---	---	---	---		
Hillon----------	0-3	27-35	1.20-1.40	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	3-29	20-35	1.30-1.60	0.06-0.20	0.15-0.18	Moderate	0.5-1.0	0.43	0.43		
	29-60	20-35	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
DA:											
Denied access.											
M-W:											
Miscellaneous water.											
W:											
Water.											

Chemical Properties of the Soils

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
13A:								
McKenzie----------	0-5	40-60	20.0-25.0	8.5-9.0	---	---	8-16	---
	5-60	40-60	15.0-20.0	8.5-9.0	---	---	8-16	---
16B:								
Degrand-----------	0-6	10-27	10.0-15.0	6.6-7.8	---	---	---	---
	6-15	20-35	15.0-20.0	6.6-8.4	---	---	---	---
	15-26	15-30	10.0-15.0	7.4-9.0	15-40	---	0-4	---
	26-60	0-5	1.0-5.0	7.9-8.4	8-15	---	0-2	---
22E:								
Hillon------------	0-3	20-27	10.0-25.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
22F:								
Hillon------------	0-3	20-27	10.0-25.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
24A:								
Hanly-------------	0-7	5-10	5.0-10.0	6.6-8.4	1-5	---	---	---
	7-60	5-10	5.0-10.0	6.6-8.4	1-5	---	---	---
27B:								
Attewan-----------	0-6	10-20	5.0-10.0	6.1-7.3	---	---	---	---
	6-17	20-35	15.0-20.0	6.6-7.8	---	---	---	---
	17-27	15-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	27-60	0-10	1.0-5.0	7.4-8.4	5-10	---	0-2	---
28A:								
Nishon------------	0-6	27-35	15.0-20.0	6.1-7.8	---	---	---	---
	6-24	40-60	30.0-35.0	6.6-9.0	---	---	0-2	---
	24-60	35-55	30.0-35.0	7.4-9.0	1-15	1-3	2-4	---
30A:								
Marvan------------	0-4	40-60	25.0-30.0	7.4-8.4	1-5	---	0-8	0-4
	4-32	45-60	25.0-30.0	7.9-9.0	1-10	1-3	2-4	4-13
	32-60	45-60	25.0-30.0	7.9-9.0	1-10	1-5	4-16	13-38
30C:								
Marvan------------	0-4	40-60	25.0-30.0	7.4-8.4	1-5	---	0-8	0-4
	4-32	45-60	25.0-30.0	7.9-9.0	1-10	1-3	2-4	4-13
	32-60	45-60	25.0-30.0	7.9-9.0	1-10	1-5	4-16	13-38
31A:								
Ferd--------------	0-7	20-27	10.0-20.0	6.6-7.3	---	---	---	---
	7-15	35-50	15.0-30.0	6.6-8.4	---	---	0-2	---
	15-42	27-40	10.0-25.0	7.9-9.0	5-15	---	2-8	0-13
	42-60	27-40	10.0-25.0	8.4-9.6	5-15	1-3	4-8	8-13
32A:								
Kobase------------	0-5	27-40	25.0-30.0	6.6-8.4	---	---	0-2	1-5
	5-12	35-45	20.0-25.0	7.4-8.4	5-10	---	0-2	1-5
	12-40	35-45	20.0-25.0	7.4-8.4	5-10	---	0-2	5-10
	40-60	35-45	20.0-25.0	7.9-9.0	5-15	1-5	0-4	8-13
33A:								
Phillips----------	0-10	15-27	10.0-15.0	6.1-7.3	---	---	0-2	---
	10-20	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	20-48	25-40	15.0-20.0	7.4-9.0	5-15	---	2-4	0-13
	48-60	20-35	15.0-20.0	7.4-9.0	5-10	1-3	4-8	0-13

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
34A:								
Dimmick---------	0-21	40-50	25.0-30.0	6.1-7.8	---	---	---	---
	21-60	40-60	20.0-25.0	6.6-8.4	---	---	---	---
36A:								
Chinook---------	0-4	5-18	10.0-15.0	6.6-8.4	---	---	0-2	---
	4-21	5-18	5.0-10.0	6.6-8.4	---	---	0-2	---
	21-41	5-18	5.0-10.0	6.6-9.0	3-15	---	0-2	---
	41-60	5-15	5.0-10.0	7.4-9.0	1-5	---	0-2	---
36C:								
Chinook---------	0-4	5-18	10.0-15.0	6.6-8.4	---	---	0-2	---
	4-21	5-18	5.0-10.0	6.6-8.4	---	---	0-2	---
	21-41	5-18	5.0-10.0	6.6-9.0	3-15	---	0-2	---
	41-60	5-15	5.0-10.0	7.4-9.0	1-5	---	0-2	---
37A:								
Evanston--------	0-7	20-27	15.0-20.0	6.6-7.8	---	---	---	---
	7-18	25-35	20.0-25.0	6.6-7.8	---	---	---	---
	18-60	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
51A:								
Wheatbelt-------	0-2	60-85	35.0-70.0	7.9-9.0	---	---	2-8	4-13
	2-16	60-85	35.0-70.0	7.9-9.0	---	---	2-8	13-30
	16-60	60-85	35.0-70.0	7.9-9.0	0-2	2-5	8-16	13-30
53D:								
Beaverton-------	0-4	15-27	15.0-20.0	6.6-7.8	---	---	---	---
	4-16	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	16-60	0-10	1.0-5.0	7.4-8.4	5-15	---	0-2	---
55A:								
Benz------------	0-2	27-35	10.0-25.0	7.4-9.0	5-10	---	4-8	4-13
	2-60	18-35	10.0-20.0	8.4-9.6	5-15	2-5	8-16	13-30
60A:								
Havre-----------	0-5	15-27	15.0-20.0	6.1-8.4	1-5	---	0-2	---
	5-60	18-35	15.0-25.0	7.4-8.4	1-5	---	0-4	---
62C:								
Weingart--------	0-5	27-40	30.0-35.0	5.6-7.8	---	---	0-2	10-20
	5-10	40-60	30.0-35.0	6.6-9.6	---	---	2-8	10-30
	10-16	35-55	30.0-35.0	7.9-9.6	5-15	1-5	4-16	13-30
	16-22	35-55	30.0-35.0	7.9-9.6	---	1-5	4-16	13-30
	22-60	---	---	---	---	---	---	---
Weingart, thin surface--------	0-2	40-45	30.0-35.0	5.6-7.8	---	---	0-2	10-20
	2-8	40-60	30.0-35.0	6.6-9.6	---	---	2-8	10-30
	8-16	35-55	30.0-35.0	7.9-9.6	5-15	1-5	4-16	13-30
	16-22	35-55	30.0-35.0	7.9-9.6	---	1-5	4-16	13-30
	22-60	---	---	---	---	---	---	---
72F:								
Zahill----------	0-3	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	3-28	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	28-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
74B:								
Marias----------	0-6	40-60	30.0-35.0	7.4-8.4	1-10	---	0-4	1-4
	6-30	35-60	25.0-30.0	7.9-9.0	1-10	---	0-4	1-4
	30-60	35-60	25.0-30.0	7.9-9.0	2-10	1-6	2-8	4-13

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
75B:								
Farnuf----------	0-9	15-27	10.0-15.0	6.1-7.8	---	---	---	---
	9-18	25-35	15.0-20.0	6.1-7.8	---	---	---	---
	18-60	20-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
75C:								
Farnuf----------	0-9	15-27	10.0-15.0	6.1-7.8	---	---	---	---
	9-18	25-35	15.0-20.0	6.1-7.8	---	---	---	---
	18-60	20-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
76B:								
Bowery----------	0-24	18-27	20.0-30.0	6.1-7.3	---	---	---	---
	24-44	18-27	10.0-20.0	6.1-7.3	---	---	---	---
	44-60	10-27	5.0-15.0	6.1-7.3	---	---	---	---
76C:								
Bowery----------	0-24	18-27	20.0-30.0	6.1-7.3	---	---	---	---
	24-44	18-27	10.0-20.0	6.1-7.3	---	---	---	---
	44-60	10-27	5.0-15.0	6.1-7.3	---	---	---	---
76D:								
Bowery----------	0-24	18-27	20.0-30.0	6.1-7.3	---	---	---	---
	24-44	18-27	10.0-20.0	6.1-7.3	---	---	---	---
	44-60	10-27	5.0-15.0	6.1-7.3	---	---	---	---
78A:								
Lostriver-------	0-3	40-55	25.0-50.0	7.4-9.4	0-10	---	2-8	8-13
	3-9	35-55	25.0-50.0	7.4-9.6	5-10	---	4-16	13-20
	9-60	35-55	25.0-50.0	7.4-9.6	5-10	2-5	8-16	13-30
79B:								
Yamacall--------	0-6	18-27	15.0-20.0	7.4-8.4	0-5	---	---	---
	6-40	18-35	10.0-15.0	7.9-9.0	5-15	0-1	0-4	1-5
	40-60	10-27	10.0-15.0	7.9-9.0	5-10	---	0-4	1-5
81A:								
Glendive--------	0-6	5-15	10.0-15.0	6.6-8.4	---	---	0-4	---
	6-12	5-18	10.0-15.0	7.4-8.4	5-10	---	0-4	---
	12-60	5-18	10.0-15.0	7.4-8.4	5-10	---	2-4	---
84A:								
Bullhook--------	0-3	27-40	15.0-35.0	7.4-9.4	5-10	---	2-8	8-13
	3-8	18-35	10.0-30.0	7.4-9.6	5-10	---	4-16	13-20
	8-60	18-35	10.0-30.0	7.9-9.6	5-10	2-5	8-16	13-30
90A:								
Harlake---------	0-10	40-55	30.0-35.0	6.6-8.4	0-5	---	0-4	0-4
	10-60	35-60	25.0-35.0	7.4-8.4	5-10	---	0-4	4-10
92B:								
Marmarth--------	0-6	20-27	15.0-20.0	6.1-7.3	---	---	---	---
	6-13	18-35	15.0-20.0	6.1-7.8	---	---	---	---
	13-30	15-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	30-60	---	---	---	---	---	---	---
93D:								
Tally-----------	0-8	10-20	15.0-20.0	6.1-7.8	---	---	---	---
	8-31	5-18	5.0-10.0	6.6-8.4	---	---	---	---
	31-60	5-18	5.0-10.0	7.4-8.4	5-15	---	0-2	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
96B:								
Fortbenton------	0-6	5-18	10.0-15.0	6.6-7.8	---	---	---	---
	6-26	5-18	5.0-10.0	6.6-7.8	---	---	---	---
	26-60	27-35	15.0-20.0	7.4-9.0	5-15	---	0-2	---
96C:								
Fortbenton------	0-6	5-18	10.0-15.0	6.6-7.8	---	---	---	---
	6-26	5-18	5.0-10.0	6.6-7.8	---	---	---	---
	26-60	27-35	15.0-20.0	7.4-9.0	5-15	---	0-2	---
98B:								
Kremlin---------	0-6	18-27	15.0-20.0	6.1-7.8	---	---	---	---
	6-19	18-30	10.0-15.0	6.6-7.8	---	---	---	---
	19-31	18-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	31-60	10-25	5.0-10.0	7.4-8.4	3-12	---	0-4	---
99A:								
Thibadeau-------	0-2	27-40	15.0-35.0	7.9-9.6	5-10	---	8-16	8-20
	2-14	18-35	10.0-30.0	7.9-9.6	5-10	---	8-16	13-20
	14-60	18-35	10.0-30.0	7.9-9.6	5-10	2-5	8-16	13-30
110D:								
Laceycreek------	0-23	15-24	15.0-25.0	6.1-7.3	---	---	---	---
	23-30	24-35	15.0-25.0	6.1-7.3	---	---	---	---
	30-42	20-35	15.0-25.0	6.6-7.3	---	---	---	---
	42-60	5-20	5.0-15.0	6.6-7.3	0-2	---	---	---
115B:								
Thoeny----------	0-6	15-27	15.0-20.0	5.6-7.8	---	---	0-4	---
	6-14	35-50	25.0-30.0	7.4-9.0	---	---	4-8	5-20
	14-27	35-50	25.0-30.0	7.4-9.0	5-10	---	4-8	13-25
	27-60	35-50	20.0-25.0	7.9-9.0	5-15	1-3	4-16	13-25
Elloam----------	0-4	20-27	20.0-25.0	6.1-7.8	---	---	0-2	---
	4-13	35-55	25.0-30.0	6.6-9.0	---	---	2-8	8-25
	13-18	30-45	20.0-25.0	7.9-9.0	5-15	---	4-8	13-25
	18-60	25-40	15.0-20.0	7.9-9.6	5-10	---	8-16	13-25
171C:								
Delpoint--------	0-5	18-27	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	5-14	18-35	15.0-20.0	7.9-8.4	5-10	---	0-4	---
	14-34	18-35	10.0-15.0	7.9-8.4	5-30	---	0-4	---
	34-60	---	---	---	---	---	---	---
Cabbart---------	0-6	18-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	6-15	18-27	5.0-10.0	7.4-9.0	15-25	---	0-4	1-5
	15-18	18-35	5.0-10.0	7.4-9.0	10-15	0-5	0-8	1-5
	18-60	---	---	---	---	---	---	---
172C:								
Delpoint, calcareous-----	0-5	18-27	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	5-14	18-35	15.0-20.0	7.9-8.4	5-10	---	0-4	---
	14-34	18-35	10.0-15.0	7.9-8.4	5-30	---	0-4	---
	34-60	---	---	---	---	---	---	---
Delpoint--------	0-5	20-27	15.0-20.0	6.6-8.4	---	---	0-4	---
	5-14	18-35	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	14-34	18-35	10.0-15.0	7.9-9.0	5-15	---	0-4	---
	34-60	---	---	---	---	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
182F:								
Garlet----------	0-4	10-25	15.0-20.0	5.6-6.5	---	---	---	---
	4-16	10-25	10.0-15.0	5.6-6.5	---	---	---	---
	16-28	10-25	10.0-15.0	5.6-7.8	---	---	---	---
	28-60	5-25	10.0-15.0	6.1-8.4	5-10	---	---	---
Elkner----------	0-6	5-10	10.0-15.0	5.6-6.5	---	---	---	---
	6-16	5-10	5.0-10.0	5.6-6.5	---	---	---	---
	16-36	5-10	5.0-10.0	5.6-6.5	---	---	---	---
	36-60	0-5	1.0-5.0	5.6-7.3	---	---	---	---
191F:								
Winkler---------	0-7	5-15	10.0-15.0	6.1-7.3	---	---	---	---
	7-15	5-15	5.0-10.0	5.6-7.3	---	---	---	---
	15-33	5-15	5.0-10.0	5.6-6.5	---	---	---	---
	33-60	5-15	5.0-10.0	5.6-6.5	---	---	---	---
Ambrant---------	0-6	5-15	15.0-25.0	5.6-7.3	---	---	---	---
	6-18	5-15	5.0-15.0	5.6-7.3	---	---	---	---
	18-33	5-18	5.0-10.0	5.6-7.3	---	---	---	---
	33-60	0-5	1.0-5.0	5.6-7.3	---	---	---	---
Winkler, dry----	0-7	5-15	10.0-15.0	6.1-7.3	---	---	---	---
	7-15	5-15	5.0-10.0	5.6-7.3	---	---	---	---
	15-33	5-15	5.0-10.0	5.6-6.5	---	---	---	---
	33-60	5-15	5.0-10.0	5.6-6.5	---	---	---	---
200F:								
Badland.								
203F:								
Cabba-----------	0-3	10-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	3-15	20-35	5.0-10.0	7.4-9.0	5-15	---	0-8	---
	15-60	---	---	---	---	---	---	---
Rock outcrop.								
204F:								
Cabba-----------	0-3	10-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	3-15	20-35	5.0-10.0	7.4-9.0	5-15	---	0-8	---
	15-60	---	---	---	---	---	---	---
Zahill----------	0-3	20-27	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	3-28	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	28-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
205F:								
Cabba-----------	0-3	10-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	3-15	20-35	5.0-10.0	7.4-9.0	5-15	---	0-8	---
	15-60	---	---	---	---	---	---	---
Macar-----------	0-4	18-27	15.0-20.0	6.6-8.4	---	---	0-2	---
	4-12	18-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	12-37	18-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	37-60	15-30	10.0-15.0	7.4-9.0	5-12	---	0-2	---
211F:								
Cabbart---------	0-6	18-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	6-15	18-27	5.0-10.0	7.4-9.0	15-25	---	0-4	1-5
	15-18	18-35	5.0-10.0	7.4-9.0	10-15	0-5	0-8	1-5
	18-60	---	---	---	---	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
211F: (cont.)								
Rock outcrop.								
212F:								
Cabbart----------	0-6	18-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	6-15	18-27	5.0-10.0	7.4-9.0	15-25	---	0-4	1-5
	15-18	18-35	5.0-10.0	7.4-9.0	10-15	0-5	0-8	1-5
	18-60	---	---	---	---	---	---	---
Hillon-----------	0-3	20-27	10.0-25.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
213E:								
Cabbart----------	0-6	18-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	6-15	18-27	5.0-10.0	7.4-9.0	15-25	---	0-4	1-5
	15-18	18-35	5.0-10.0	7.4-9.0	10-15	0-5	0-8	1-5
	18-60	---	---	---	---	---	---	---
Yawdim-----------	0-2	40-50	25.0-30.0	6.6-7.8	---	---	---	---
	2-15	35-50	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	15-60	---	---	---	---	---	---	---
221D:								
Hillon-----------	0-3	27-35	15.0-35.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
Kevin------------	0-6	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	6-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-47	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	47-60	27-35	10.0-15.0	7.9-9.0	1-5	0-2	0-2	---
224D:								
Hillon-----------	0-3	20-27	10.0-25.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
Joplin-----------	0-5	10-27	10.0-15.0	6.6-8.4	0-5	---	---	---
	5-9	25-35	15.0-20.0	6.6-8.4	0-5	---	---	---
	9-26	18-32	10.0-15.0	6.6-8.4	5-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
241A:								
Hanly------------	0-7	5-10	5.0-10.0	6.6-8.4	1-5	---	---	---
	7-60	5-10	5.0-10.0	6.6-8.4	1-5	---	---	---
251D:								
Bascovy----------	0-5	40-60	30.0-40.0	6.6-8.4	---	---	0-4	1-4
	5-11	40-60	30.0-35.0	6.1-8.4	1-5	---	0-4	5-10
	11-15	40-60	30.0-35.0	6.1-8.4	1-5	1-5	0-4	5-10
	15-26	40-60	30.0-35.0	5.1-8.4	1-5	1-5	0-8	5-10
	26-60	---	---	---	---	---	---	---
Neldore----------	0-3	40-50	30.0-35.0	5.6-7.8	---	---	0-2	---
	3-10	40-60	30.0-35.0	5.6-7.8	---	---	0-4	---
	10-16	40-60	30.0-35.0	5.6-7.8	---	---	0-4	---
	16-60	---	---	---	---	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
262A:								
Absher----------	0-2	40-55	25.0-30.0	6.6-8.4	---	---	4-8	1-5
	2-12	35-60	25.0-30.0	6.6-9.6	0-15	1-5	8-16	18-70
	12-60	35-50	20.0-25.0	7.9-9.6	4-15	1-5	16-30	18-70
Gerdrum---------	0-3	27-40	20.0-25.0	6.6-7.8	---	---	0-2	---
	3-19	35-55	25.0-35.0	7.4-9.0	---	---	1-8	10-20
	19-60	30-50	20.0-25.0	7.9-9.0	5-15	1-5	8-16	13-30
272C:								
Attewan---------	0-6	10-20	5.0-10.0	6.1-7.3	---	---	---	---
	6-17	20-35	15.0-20.0	6.6-7.8	---	---	---	---
	17-27	15-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	27-60	0-10	1.0-5.0	7.4-8.4	5-10	---	0-2	---
Tinsley---------	0-7	5-10	5.0-10.0	7.4-8.4	1-5	---	---	---
	7-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-2	---
304A:								
Marvan----------	0-4	40-60	30.0-35.0	7.9-9.0	1-5	---	2-8	8-18
	4-13	45-60	30.0-35.0	7.9-9.0	1-10	---	2-8	13-38
	13-60	45-60	25.0-30.0	7.9-9.0	1-10	1-5	8-16	13-38
Nobe------------	0-4	40-50	25.0-30.0	6.6-8.4	1-5	---	4-8	0-30
	4-17	35-60	25.0-30.0	7.9-10.0	1-5	1-6	16-30	13-40
	17-60	35-60	25.0-30.0	7.9-10.0	1-5	1-6	16-30	15-70
309A:								
Marvan, saline--	0-4	40-60	30.0-35.0	7.9-9.0	1-5	---	2-8	8-18
	4-13	45-60	30.0-35.0	7.9-9.0	5-10	---	2-8	13-38
	13-60	45-60	25.0-30.0	7.9-9.0	5-10	1-5	8-16	13-38
Marvan----------	0-4	40-60	25.0-30.0	7.4-8.4	1-5	---	0-4	0-4
	4-32	45-60	25.0-30.0	7.9-9.0	5-10	1-3	2-4	4-13
	32-60	45-60	25.0-30.0	7.9-9.0	5-10	1-5	4-16	13-38
311B:								
Ferd------------	0-7	20-27	10.0-20.0	6.6-7.3	---	---	---	---
	7-15	35-50	15.0-30.0	6.6-8.4	---	---	0-2	---
	15-42	27-40	10.0-25.0	7.9-9.0	5-15	---	2-8	0-13
	42-60	27-40	10.0-25.0	8.4-9.6	5-15	1-3	4-8	8-13
Creed-----------	0-7	20-27	15.0-20.0	6.1-8.4	---	---	0-4	---
	7-16	35-55	25.0-35.0	6.6-9.0	---	---	2-4	8-13
	16-29	27-45	20.0-30.0	7.9-9.0	5-15	0-2	4-8	13-20
	29-60	25-35	15.0-20.0	7.9-9.0	5-10	0-2	4-16	13-25
Gerdrum---------	0-3	27-40	20.0-25.0	6.6-7.8	---	---	0-2	---
	3-19	35-55	25.0-35.0	7.4-9.0	---	---	1-8	10-20
	19-60	30-50	20.0-25.0	7.9-9.0	5-15	1-5	8-16	13-30
321A:								
Kobase----------	0-5	27-40	25.0-30.0	7.4-8.4	5-10	---	0-2	1-5
	5-40	35-45	20.0-25.0	7.4-9.0	5-15	---	0-2	5-10
	40-60	35-45	20.0-25.0	7.9-9.0	5-15	1-5	0-4	8-13
331B:								
Phillips--------	0-10	15-27	10.0-15.0	6.1-7.3	---	---	0-2	---
	10-20	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	20-40	25-40	15.0-20.0	7.4-9.0	5-15	---	2-4	0-13
	40-60	20-35	15.0-20.0	7.4-9.0	5-10	1-3	4-8	0-13

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
331B: (cont.)								
Elloam----------	0-4	20-27	20.0-25.0	6.1-7.8	---	---	0-2	---
	4-13	35-55	25.0-30.0	6.6-9.0	---	---	2-8	8-25
	13-18	30-45	20.0-25.0	7.9-9.0	5-15	---	4-8	13-25
	18-60	25-40	15.0-20.0	7.9-9.6	5-10	---	8-16	13-25
334B:								
Phillips--------	0-10	15-27	10.0-15.0	6.1-7.3	---	---	0-2	---
	10-20	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	20-48	25-40	15.0-20.0	7.4-9.0	5-15	---	2-4	0-13
	48-60	20-35	15.0-20.0	7.4-9.0	5-10	1-3	4-8	0-13
Kevin-----------	0-6	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	6-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-47	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	47-60	27-35	10.0-15.0	7.9-9.0	1-5	0-2	0-2	---
362C:								
Chinook---------	0-4	5-18	10.0-15.0	6.6-8.4	---	---	0-2	---
	4-21	5-18	5.0-10.0	6.6-8.4	---	---	0-2	---
	21-41	5-18	5.0-10.0	6.6-9.0	3-15	---	0-2	---
	41-60	5-15	5.0-10.0	7.4-9.0	1-5	---	0-2	---
Yetull----------	0-8	0-10	5.0-10.0	6.6-7.8	---	---	---	---
	8-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-4	---
375B:								
Evanston--------	0-7	20-27	15.0-20.0	6.6-7.8	---	---	---	---
	7-18	25-35	20.0-25.0	6.6-7.8	---	---	---	---
	18-60	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
Lonna-----------	0-6	18-27	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	6-11	18-35	10.0-15.0	7.4-8.4	5-10	---	0-2	---
	11-52	18-35	10.0-15.0	7.9-9.0	5-15	---	2-8	1-13
	52-60	10-35	5.0-15.0	7.9-9.0	5-15	---	2-16	10-30
381A:								
Ethridge--------	0-7	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	7-15	35-45	25.0-30.0	6.6-8.4	---	---	---	---
	15-33	30-45	20.0-25.0	7.4-8.4	5-15	---	---	1-5
	33-60	25-40	20.0-25.0	7.4-8.4	5-15	1-3	2-4	1-5
400F:								
Rubble land.								
Rock outcrop.								
402A:								
Gerdrum---------	0-3	27-40	20.0-25.0	6.6-7.8	---	---	0-2	---
	3-19	35-55	25.0-35.0	7.4-9.0	---	---	1-8	10-20
	19-60	30-50	20.0-25.0	7.9-9.0	5-15	1-5	8-16	13-30
Absher----------	0-2	40-55	25.0-30.0	6.6-8.4	---	---	4-8	1-5
	2-8	35-60	25.0-30.0	6.6-8.4	---	---	8-16	18-70
	8-60	35-50	20.0-25.0	7.9-9.6	4-15	1-5	16-30	18-70
Creed-----------	0-7	20-27	15.0-20.0	6.1-8.4	---	---	0-4	---
	7-16	35-55	25.0-35.0	6.6-9.0	---	---	2-4	8-13
	16-29	27-45	20.0-30.0	7.9-9.0	5-15	0-2	4-8	13-20
	29-60	25-35	15.0-20.0	7.9-9.0	5-10	0-2	4-16	13-25

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
421C:								
Joplin----------	0-5	10-27	10.0-15.0	6.6-8.4	0-5	---	---	---
	5-9	25-35	15.0-20.0	6.6-8.4	0-5	---	---	---
	9-26	18-32	10.0-15.0	6.6-8.4	5-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
Hillon----------	0-3	20-27	10.0-25.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
441C:								
Kevin-----------	0-6	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	6-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-47	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	47-60	27-35	10.0-15.0	7.9-9.0	1-5	0-2	0-2	---
Hillon----------	0-3	27-35	15.0-35.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
442C:								
Kevin-----------	0-6	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	6-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-47	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	47-60	27-35	10.0-15.0	7.9-9.0	1-5	0-2	0-2	---
Elloam----------	0-4	20-27	20.0-25.0	6.1-7.8	---	---	0-2	---
	4-13	35-55	25.0-30.0	6.6-9.0	---	---	2-8	8-25
	13-18	30-45	20.0-25.0	7.9-9.0	5-15	---	4-8	13-25
	18-60	25-40	15.0-20.0	7.9-9.6	5-10	---	8-16	13-25
501B:								
Telstad---------	0-6	18-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-12	25-35	20.0-25.0	6.6-8.4	---	---	---	---
	12-40	20-32	15.0-20.0	7.9-8.4	5-15	---	2-4	---
	40-60	20-32	15.0-20.0	7.9-9.0	3-12	0-3	2-4	---
Hillon----------	0-3	20-27	10.0-25.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
503B:								
Telstad---------	0-6	18-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-12	25-35	20.0-25.0	6.6-8.4	---	---	---	---
	12-40	20-32	15.0-20.0	7.9-8.4	5-15	---	2-4	---
	40-60	20-32	15.0-20.0	7.9-9.0	3-12	0-3	2-4	---
Joplin----------	0-5	10-27	10.0-15.0	6.6-7.8	0-5	---	---	---
	5-9	25-35	15.0-20.0	6.6-8.4	0-5	---	---	---
	9-26	18-32	10.0-15.0	6.6-8.4	5-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-4	---
503C:								
Telstad---------	0-6	18-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-12	25-35	20.0-25.0	6.6-8.4	---	---	---	---
	12-40	20-32	15.0-20.0	7.9-8.4	5-15	---	2-4	---
	40-60	20-32	15.0-20.0	7.9-9.0	3-12	0-3	2-4	---
Joplin----------	0-5	10-27	10.0-15.0	6.6-8.4	0-5	---	---	---
	5-9	25-35	15.0-20.0	6.6-8.4	0-5	---	---	---
	9-26	18-32	10.0-15.0	6.6-8.4	5-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
522A:								
Elloam----------	0-4	20-27	20.0-25.0	6.1-7.8	---	---	0-2	---
	4-13	35-55	25.0-30.0	6.6-9.0	---	---	2-8	8-25
	13-18	30-45	20.0-25.0	7.9-9.0	5-15	---	4-8	13-25
	18-60	25-40	15.0-20.0	7.9-9.6	5-10	---	8-16	13-25
Absher----------	0-2	40-55	25.0-30.0	6.6-8.4	---	---	4-8	1-5
	2-8	35-60	25.0-30.0	6.6-8.4	---	---	8-16	18-70
	8-60	35-50	20.0-25.0	7.9-9.6	4-15	1-5	16-30	18-70
530F:								
Warwood---------	0-4	20-27	10.0-20.0	5.6-6.5	---	---	---	---
	4-15	15-30	5.0-15.0	5.6-6.5	---	---	---	---
	15-20	20-35	10.0-20.0	5.6-6.5	---	---	---	---
	20-45	27-35	10.0-20.0	6.1-7.3	---	---	---	---
	45-60	20-35	10.0-20.0	6.1-7.3	---	---	---	---
561B:								
Scobey----------	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-14	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	14-60	30-40	15.0-20.0	7.4-8.4	5-15	0-6	0-2	0-8
Kevin-----------	0-6	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	6-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-47	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	47-60	27-35	10.0-15.0	7.9-9.0	1-5	0-2	0-2	---
561C:								
Scobey----------	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-14	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	14-60	30-40	15.0-20.0	7.4-9.0	5-15	0-6	0-2	0-8
Kevin-----------	0-6	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	6-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-47	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	47-60	27-35	10.0-15.0	7.9-9.0	1-5	0-2	0-2	---
564B:								
Scobey----------	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-14	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	14-60	30-40	15.0-20.0	7.4-9.0	5-15	0-6	0-2	0-8
Hillon----------	0-3	27-35	15.0-35.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
571D:								
Chinook---------	0-4	5-18	10.0-15.0	6.6-8.4	---	---	0-2	---
	4-21	5-18	5.0-10.0	6.6-8.4	---	---	0-2	---
	21-41	5-18	5.0-10.0	6.6-9.0	3-15	---	0-2	---
	41-60	5-15	5.0-10.0	7.4-9.0	1-5	---	0-2	---
Cozberg---------	0-7	10-20	15.0-20.0	6.6-7.8	---	---	---	---
	7-17	10-18	10.0-15.0	6.6-7.8	---	---	---	---
	17-24	10-18	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	0-10	1.0-5.0	7.4-8.4	5-15	---	0-2	---
Yetull----------	0-8	0-10	5.0-10.0	6.6-7.8	---	---	---	---
	8-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-4	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
573B:								
Cozberg	0-7	10-20	15.0-20.0	6.6-7.8	---	---	---	---
	7-17	10-18	10.0-15.0	6.6-7.8	---	---	---	---
	17-24	10-18	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	0-10	1.0-5.0	7.4-8.4	5-15	---	0-2	---
Chinook	0-4	5-18	10.0-15.0	6.6-8.4	---	---	0-2	---
	4-21	5-18	5.0-10.0	6.6-8.4	---	---	0-2	---
	21-41	5-18	5.0-10.0	6.6-9.0	3-15	---	0-2	---
	41-60	5-15	5.0-10.0	7.4-9.0	1-5	---	0-2	---
603A:								
Havre	0-5	27-40	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	5-60	18-35	15.0-25.0	7.4-8.4	5-10	---	0-4	---
Harlake	0-10	27-40	20.0-25.0	7.4-8.4	5-10	---	0-4	0-4
	10-60	35-60	25.0-35.0	7.4-8.4	5-10	---	0-4	4-10
604A:								
Havre	0-5	15-27	15.0-20.0	7.4-8.4	1-5	---	0-2	---
	5-60	18-35	15.0-25.0	7.4-8.4	1-5	---	0-4	---
Glendive	0-6	5-15	10.0-15.0	6.6-8.4	1-5	---	0-4	---
	6-12	5-18	10.0-15.0	7.4-8.4	5-10	---	0-4	---
	12-60	5-18	10.0-15.0	7.4-8.4	5-10	---	2-4	---
611B:								
Hingham	0-7	7-18	5.0-15.0	6.1-7.8	---	---	---	---
	7-14	5-18	5.0-15.0	6.1-7.8	---	---	---	---
	14-60	5-18	5.0-10.0	7.9-8.4	5-15	---	---	---
Lonna	0-6	18-27	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	6-11	18-35	10.0-15.0	7.4-8.4	5-10	---	0-2	---
	11-52	18-35	10.0-15.0	7.9-9.0	5-15	---	2-8	1-13
	52-60	10-35	5.0-15.0	7.9-9.0	5-15	---	2-16	10-30
661C:								
Twilight	0-6	5-18	10.0-15.0	6.6-7.8	---	---	---	---
	6-14	5-18	5.0-10.0	6.6-7.8	---	---	---	---
	14-29	5-18	5.0-10.0	7.4-8.4	5-10	---	0-4	---
	29-60	---	---	---	---	---	---	---
Blacksheep	0-6	5-15	5.0-10.0	7.4-8.4	---	---	---	---
	6-17	5-15	5.0-10.0	7.9-8.4	5-10	---	0-2	---
	17-60	---	---	---	---	---	---	---
671B:								
Bearpaw	0-5	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	5-13	35-50	25.0-30.0	6.6-7.8	---	---	---	---
	13-41	35-45	20.0-25.0	7.4-8.4	5-15	---	2-4	1-5
	41-60	30-45	20.0-25.0	7.4-8.4	5-10	0-2	2-4	5-8
Vida	0-5	27-30	20.0-25.0	6.6-7.8	---	---	0-2	---
	5-8	25-35	15.0-25.0	6.6-7.8	---	---	0-2	---
	8-22	25-35	15.0-20.0	7.4-8.4	5-15	---	0-2	---
	22-60	25-35	15.0-20.0	7.9-8.4	2-12	0-2	0-2	---
671C:								
Bearpaw	0-5	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	5-13	35-50	25.0-30.0	6.6-7.8	---	---	---	---
	13-41	35-45	20.0-25.0	7.4-8.4	5-15	---	2-4	1-5
	41-60	30-45	20.0-25.0	7.4-8.4	5-10	0-2	2-8	5-8

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
671C: (cont.)								
Vida------------	0-5	27-30	20.0-25.0	6.6-7.8	---	---	0-2	---
	5-8	25-35	15.0-25.0	6.6-7.8	---	---	0-2	---
	8-22	25-35	15.0-20.0	7.4-8.4	5-15	---	0-2	---
	22-60	25-35	15.0-20.0	7.9-9.0	2-12	0-2	0-2	---
671D:								
Bearpaw---------	0-5	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	5-13	35-50	25.0-30.0	6.6-7.8	---	---	---	---
	13-41	35-45	20.0-25.0	7.4-8.4	5-15	---	2-4	1-5
	41-60	30-45	20.0-25.0	7.4-8.4	5-10	0-2	2-8	5-8
Vida------------	0-5	27-30	20.0-25.0	6.6-7.8	---	---	0-2	---
	5-8	25-35	15.0-25.0	6.6-8.4	---	---	0-2	---
	8-22	25-35	15.0-20.0	7.4-7.8	5-15	---	0-2	---
	22-60	25-35	15.0-20.0	7.9-9.0	2-12	0-2	0-2	---
674B:								
Bearpaw---------	0-5	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	5-13	35-50	25.0-30.0	6.6-7.8	---	---	---	---
	13-41	35-45	20.0-25.0	7.4-8.4	5-15	---	2-4	1-5
	41-60	30-45	20.0-25.0	7.4-8.4	5-10	0-2	2-8	5-8
Waltham---------	0-2	27-40	15.0-20.0	6.6-7.8	---	---	0-2	0-4
	2-10	45-60	30.0-40.0	7.4-8.4	---	---	0-2	4-13
	10-17	35-45	20.0-25.0	7.9-9.0	5-15	---	0-4	13-25
	17-60	27-40	15.0-20.0	7.4-9.0	5-10	3-5	4-16	4-20
696C:								
Vida------------	0-5	27-30	20.0-25.0	6.6-7.8	---	---	0-2	---
	5-8	25-35	15.0-25.0	6.6-7.8	---	---	0-2	---
	8-22	25-35	15.0-20.0	7.4-8.4	5-15	---	0-2	---
	22-60	25-35	15.0-20.0	7.9-9.0	2-12	0-2	0-2	---
Zahill----------	0-3	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	3-28	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	28-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
Bearpaw---------	0-5	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	5-13	35-50	25.0-30.0	6.6-7.8	---	---	---	---
	13-41	35-45	20.0-25.0	7.4-8.4	5-15	---	2-4	1-5
	41-60	30-45	20.0-25.0	7.4-8.4	5-10	0-2	2-8	5-8
701D:								
Yetull----------	0-8	0-10	5.0-10.0	7.4-8.4	5-10	---	---	---
	8-60	0-10	1.0-5.0	7.4-8.4	5-10	---	0-4	---
Busby-----------	0-4	10-18	10.0-15.0	7.4-8.4	1-5	---	---	---
	4-14	10-18	10.0-15.0	7.4-8.4	1-5	---	---	---
	14-41	10-18	5.0-15.0	7.9-8.4	5-15	---	0-2	---
	41-60	3-18	5.0-10.0	7.9-8.4	5-15	1-2	0-4	---
721E:								
Zahill----------	0-3	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	3-28	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	28-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
Vida------------	0-5	27-30	20.0-25.0	6.6-7.8	---	---	0-2	---
	5-8	25-35	15.0-25.0	6.6-7.8	---	---	0-2	---
	8-22	25-35	15.0-20.0	7.4-8.4	5-15	---	0-2	---
	22-60	25-35	15.0-20.0	7.9-9.0	2-12	0-2	0-2	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
722D:								
Zahill----------	0-3	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	3-28	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	28-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
Vida------------	0-5	27-30	20.0-25.0	6.6-7.8	---	---	0-2	---
	5-8	25-35	15.0-25.0	6.6-7.8	---	---	0-2	---
	8-22	25-35	15.0-20.0	7.4-8.4	5-15	---	0-2	---
	22-60	25-35	15.0-20.0	7.9-9.0	2-12	0-2	0-2	---
725F:								
Zahill----------	0-3	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	3-28	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	28-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
Rock outcrop.								
729F:								
Zahill----------	0-3	27-35	20.0-25.0	7.4-8.4	---	---	0-2	---
	3-28	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	28-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
Obrien----------	0-21	27-35	25.0-45.0	6.6-7.3	---	---	---	---
	21-37	18-35	10.0-30.0	7.9-8.4	5-15	---	0-4	0-13
	37-60	18-35	10.0-30.0	7.9-9.0	5-15	---	0-4	0-13
732C:								
Yetull----------	0-8	0-10	5.0-10.0	6.6-7.8	---	---	---	---
	8-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-4	---
Lonesome--------	0-5	5-15	5.0-10.0	6.6-7.8	---	---	---	---
	5-15	5-15	5.0-10.0	6.6-7.8	---	---	---	---
	15-30	5-15	0.0-10.0	7.9-8.4	5-15	---	---	---
	30-60	20-35	10.0-20.0	7.9-9.0	5-15	---	0-4	0-13
761D:								
Hedoes----------	0-5	10-15	15.0-20.0	6.6-7.3	---	---	---	---
	5-34	5-15	15.0-20.0	6.6-8.4	---	---	---	---
	34-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-4	---
Belain----------	0-3	15-20	15.0-20.0	6.1-7.8	---	---	---	---
	3-12	10-18	10.0-15.0	6.6-8.4	---	---	---	---
	12-18	10-18	5.0-10.0	6.6-8.4	---	---	---	---
	18-32	10-18	5.0-10.0	7.4-8.4	1-10	---	0-2	---
	32-60	---	---	---	---	---	---	---
761F:								
Hedoes----------	0-5	10-15	15.0-20.0	6.6-7.3	---	---	---	---
	5-34	5-15	15.0-20.0	6.6-8.4	---	---	---	---
	34-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-4	---
Belain----------	0-3	15-20	15.0-20.0	6.1-7.8	---	---	---	---
	3-12	10-18	10.0-15.0	6.6-8.4	---	---	---	---
	12-18	10-18	5.0-10.0	6.6-8.4	---	---	---	---
	18-32	10-18	5.0-10.0	7.4-8.4	1-10	---	0-2	---
	32-60	---	---	---	---	---	---	---
763E:								
Laceycreek------	0-23	15-24	15.0-25.0	6.1-7.3	---	---	---	---
	23-30	24-35	15.0-25.0	6.1-7.3	---	---	---	---
	30-42	20-35	15.0-25.0	6.6-7.3	---	---	---	---
	42-60	5-20	5.0-15.0	6.6-7.3	0-2	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
791C:								
Yamacall--------	0-6	18-27	15.0-20.0	7.4-8.4	0-5	---	---	---
	6-40	18-35	10.0-15.0	7.9-9.0	10-15	0-1	0-4	1-5
	40-60	10-27	10.0-15.0	7.9-9.0	5-10	---	0-4	1-5
Hillon----------	0-3	20-27	10.0-25.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
795C:								
Yamacall--------	0-6	27-35	15.0-20.0	7.4-8.4	0-5	---	---	---
	6-40	18-35	10.0-15.0	7.9-9.0	10-15	0-1	0-4	1-5
	40-60	10-27	10.0-15.0	7.9-9.0	5-10	---	0-4	1-5
Benz------------	0-2	27-35	10.0-25.0	7.4-9.0	5-10	---	4-8	4-13
	2-60	18-35	10.0-20.0	8.4-9.6	5-15	2-5	8-16	13-30
799C:								
Yamacall--------	0-6	27-35	15.0-20.0	7.4-8.4	0-5	---	---	---
	6-40	18-35	10.0-15.0	7.9-9.0	10-15	0-1	0-4	1-5
	40-60	10-27	10.0-15.0	7.9-9.0	5-10	---	0-4	1-5
801B:								
Williams--------	0-4	15-27	15.0-20.0	6.6-7.3	---	---	---	---
	4-14	24-35	15.0-20.0	6.6-7.8	---	---	---	---
	14-60	22-35	15.0-20.0	7.9-8.4	5-15	0-3	---	---
Vida------------	0-5	15-27	15.0-20.0	6.6-7.8	---	---	0-2	---
	5-8	25-35	15.0-25.0	6.6-7.8	---	---	0-2	---
	8-22	25-35	15.0-20.0	7.4-8.4	5-15	---	0-2	---
	22-60	25-35	15.0-20.0	7.9-8.4	2-12	0-2	0-2	---
801C:								
Williams--------	0-4	15-27	15.0-20.0	6.6-7.3	---	---	---	---
	4-14	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	14-60	24-35	15.0-20.0	7.9-8.4	5-15	0-3	---	---
Vida------------	0-5	15-27	15.0-20.0	6.6-7.8	---	---	0-2	---
	5-8	25-35	15.0-25.0	6.6-7.8	---	---	0-2	---
	8-22	25-35	15.0-20.0	7.4-8.4	5-15	---	0-2	---
	22-60	25-35	15.0-20.0	7.9-9.0	2-12	0-2	0-2	---
812A:								
Glendive--------	0-6	5-15	10.0-15.0	7.4-8.4	5-10	---	0-4	---
	6-12	5-18	5.0-10.0	7.4-8.4	5-10	---	0-4	---
	12-60	5-18	5.0-10.0	7.4-8.4	5-10	---	2-4	---
831A:								
Straw-----------	0-41	20-27	20.0-25.0	6.6-8.4	0-5	---	0-2	---
	41-60	22-35	20.0-25.0	7.4-8.4	2-12	---	0-2	---
Korchea---------	0-6	18-27	15.0-20.0	6.6-8.4	1-5	---	---	---
	6-60	18-35	15.0-20.0	7.4-8.4	5-10	---	0-4	---
832A:								
Nesda-----------	0-13	10-20	15.0-20.0	6.6-7.8	0-5	---	---	---
	13-60	0-10	1.0-5.0	7.4-8.4	0-5	---	0-2	---
Nesda-----------	0-13	10-20	15.0-20.0	6.6-7.8	0-5	---	---	---
	13-60	0-10	1.0-5.0	7.4-8.4	0-5	---	0-2	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
833A:								
Enbar	0-23	18-27	20.0-25.0	6.6-8.4	1-5	---	---	---
	23-30	18-30	15.0-20.0	7.9-8.4	5-10	---	---	---
	30-60	18-27	10.0-15.0	7.9-8.4	5-10	---	0-2	---
Straw	0-41	20-27	20.0-25.0	6.6-8.4	0-5	---	0-2	---
	41-60	22-35	20.0-25.0	7.4-8.4	2-12	---	0-2	---
Eagleton	0-7	18-27	20.0-25.0	6.6-7.8	---	---	---	---
	7-37	18-35	20.0-25.0	6.6-7.8	---	---	---	---
	37-60	18-35	15.0-20.0	6.6-7.8	---	---	---	---
842A:								
Bullhook	0-3	27-40	15.0-35.0	7.4-9.4	5-10	---	2-8	8-13
	3-8	18-35	10.0-30.0	7.4-9.6	5-10	---	4-16	13-20
	8-60	18-35	10.0-30.0	7.9-9.6	5-10	2-5	8-16	13-30
Nobe	0-4	40-60	25.0-30.0	6.6-8.4	1-5	---	4-8	0-30
	4-17	35-60	25.0-30.0	7.9-10.0	1-6	5-10	16-30	13-40
	17-60	35-60	25.0-30.0	7.9-10.0	1-6	5-10	16-30	15-70
883F:								
Perma	0-10	7-20	10.0-20.0	6.6-7.3	---	---	---	---
	10-30	7-20	10.0-15.0	6.6-7.8	---	---	---	---
	30-60	0-15	1.0-5.0	6.6-7.8	---	---	---	---
Whitlash	0-7	10-20	10.0-20.0	6.1-7.3	---	---	---	---
	7-17	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	17-60	---	---	---	---	---	---	---
892F:								
Whitlash	0-7	10-20	10.0-20.0	6.1-7.3	---	---	---	---
	7-17	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	17-60	---	---	---	---	---	---	---
Belain	0-3	15-20	15.0-20.0	6.1-7.8	---	---	---	---
	3-12	10-18	10.0-15.0	6.6-8.4	---	---	---	---
	12-18	10-18	5.0-10.0	6.6-8.4	---	---	---	---
	18-32	10-18	5.0-10.0	7.4-8.4	1-10	---	0-2	---
	32-60	---	---	---	---	---	---	---
Rock outcrop.								
895F:								
Whitlash	0-7	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	7-17	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	17-60	---	---	---	---	---	---	---
Perma	0-10	7-20	10.0-20.0	6.6-7.3	---	---	---	---
	10-30	7-20	10.0-15.0	6.6-7.8	---	---	---	---
	30-60	0-15	1.0-5.0	6.6-7.8	---	---	---	---
Rock outcrop.								
896F:								
Perma	0-10	7-20	10.0-20.0	6.6-7.3	---	---	---	---
	10-30	7-20	10.0-15.0	6.6-7.8	---	---	---	---
	30-60	0-15	1.0-5.0	6.6-7.8	---	---	---	---
Whitlash	0-7	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	7-17	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	17-60	---	---	---	---	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
896F: (cont.)								
Rock outcrop.								
899F:								
Zahill----------	0-3	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	3-28	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	28-60	20-35	15.0-20.0	7.4-9.0	2-12	1-5	0-2	---
Rock outcrop.								
Whitlash--------	0-7	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	7-17	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	17-60	---	---	---	---	---	---	---
911F:								
Belain----------	0-3	15-20	15.0-20.0	6.1-7.8	---	---	---	---
	3-12	10-18	10.0-15.0	6.6-8.4	---	---	---	---
	12-18	10-18	5.0-10.0	6.6-8.4	---	---	---	---
	18-32	10-18	5.0-10.0	7.4-8.4	1-10	---	0-2	---
	32-60	---	---	---	---	---	---	---
Whitlash--------	0-7	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	7-17	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	17-60	---	---	---	---	---	---	---
Hedoes----------	0-5	10-15	15.0-20.0	6.6-7.3	---	---	---	---
	5-34	5-15	15.0-20.0	6.6-8.4	---	---	---	---
	34-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-4	---
915F:								
Belain----------	0-3	15-20	15.0-20.0	6.1-7.8	---	---	---	---
	3-12	10-18	10.0-15.0	6.6-8.4	---	---	---	---
	12-18	10-18	5.0-10.0	6.6-8.4	---	---	---	---
	18-32	10-18	5.0-10.0	7.4-8.4	1-10	---	0-2	---
	32-60	---	---	---	---	---	---	---
Whitlash--------	0-7	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	7-17	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	17-60	---	---	---	---	---	---	---
Hedoes----------	0-5	10-15	15.0-20.0	6.6-7.3	---	---	---	---
	5-34	5-15	15.0-20.0	6.6-8.4	---	---	---	---
	34-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-4	---
951B:								
Kenilworth------	0-8	5-18	15.0-20.0	6.6-7.8	---	---	---	---
	8-16	15-30	15.0-25.0	6.6-7.8	---	---	---	---
	16-48	27-35	20.0-30.0	7.4-8.4	5-15	---	0-2	---
	48-60	27-35	20.0-30.0	7.9-9.0	5-15	1-3	0-4	---
Fortbenton------	0-6	5-18	10.0-15.0	6.6-7.8	---	---	---	---
	6-26	5-18	5.0-10.0	6.6-7.8	---	---	---	---
	26-60	27-35	15.0-20.0	7.4-9.0	5-15	---	0-2	---
962B:								
Fortbenton------	0-6	10-20	10.0-15.0	6.6-7.8	---	---	---	---
	6-26	5-18	5.0-10.0	6.6-7.8	---	---	---	---
	26-60	27-35	15.0-20.0	7.4-8.4	5-15	---	0-2	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
965B:								
Fortbenton------	0-6	5-18	10.0-15.0	6.6-7.8	---	---	---	---
	6-26	5-18	5.0-10.0	6.6-7.8	---	---	---	---
	26-60	27-35	15.0-20.0	7.4-9.0	5-15	---	0-2	---
Chinook---------	0-4	5-18	10.0-15.0	6.6-8.4	---	---	0-2	---
	4-21	5-18	5.0-10.0	6.6-8.4	---	---	0-2	---
	21-41	5-18	5.0-10.0	6.6-9.0	3-15	---	0-2	---
	41-60	5-15	5.0-10.0	7.4-9.0	1-5	---	0-2	---
968C:								
Fortbenton------	0-6	5-18	10.0-15.0	6.6-7.8	---	---	---	---
	6-26	5-18	5.0-10.0	6.6-7.8	---	---	---	---
	26-60	27-35	15.0-20.0	7.4-9.0	5-15	---	0-2	---
Hillon----------	0-3	20-27	10.0-25.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
968D:								
Hillon----------	0-3	20-27	10.0-25.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
Fortbenton------	0-6	5-18	10.0-15.0	6.6-7.8	---	---	---	---
	6-26	5-18	5.0-10.0	6.6-7.8	---	---	---	---
	26-60	27-35	15.0-20.0	7.4-9.0	5-15	---	0-2	---
971F:								
Neldore---------	0-3	40-50	30.0-35.0	5.6-7.8	---	---	0-2	---
	3-10	40-60	30.0-35.0	5.6-7.8	---	---	0-4	---
	10-16	40-60	30.0-35.0	5.6-7.8	---	---	0-4	---
	16-60	---	---	---	---	---	---	---
Bascovy---------	0-5	40-60	30.0-40.0	6.6-8.4	---	---	0-4	1-4
	5-11	40-60	30.0-35.0	6.1-8.4	1-5	---	0-4	5-10
	11-15	40-60	30.0-35.0	6.1-8.4	1-5	1-5	0-4	5-10
	15-26	40-60	30.0-35.0	5.1-8.4	1-5	1-5	0-8	5-10
	26-60	---	---	---	---	---	---	---
974F:								
Neldore---------	0-3	40-50	30.0-35.0	5.6-7.8	---	---	0-2	---
	3-10	40-60	30.0-35.0	5.6-7.8	---	---	0-4	---
	10-16	40-60	30.0-35.0	5.6-7.8	---	---	0-4	---
	16-60	---	---	---	---	---	---	---
Hillon----------	0-3	27-35	15.0-35.0	7.4-8.4	1-10	---	0-2	---
	3-29	20-35	10.0-30.0	7.9-9.0	5-15	---	0-2	---
	29-60	20-35	10.0-30.0	7.9-9.0	2-12	1-5	0-2	---
DA:								
Denied access.								
M-W:								
Miscellaneous Water.								
W:								
Water.								

Water Features

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
13A:									
McKenzie--------	D	None	---	---	---	---	Mar-Jun	Long	1.0
16B:									
Degrand---------	B	None	---	---	>6.0	---	---	---	---
22E:									
Hillon----------	C	None	---	---	>6.0	---	---	---	---
22F:									
Hillon----------	C	None	---	---	>6.0	---	---	---	---
24A:									
Hanly-----------	A	Rare	---	---	>6.0	---	---	---	---
27B:									
Attewan---------	B	None	---	---	>6.0	---	---	---	---
28A:									
Nishon----------	D	None	---	---	---	---	Apr-Aug	Long	1.0
30A:									
Marvan----------	D	None	---	---	>6.0	---	---	---	---
30C:									
Marvan----------	D	None	---	---	>6.0	---	---	---	---
31A:									
Ferd------------	C	None	---	---	>6.0	---	---	---	---
32A:									
Kobase----------	C	None	---	---	>6.0	---	---	---	---
33A:									
Phillips--------	C	None	---	---	>6.0	---	---	---	---
34A:									
Dimmick---------	D	None	---	---	-1.0-2.0	---	Apr-Jul	Long	1.0
36A:									
Chinook---------	B	None	---	---	>6.0	---	---	---	---
36C:									
Chinook---------	B	None	---	---	>6.0	---	---	---	---
37A:									
Evanston--------	B	None	---	---	>6.0	---	---	---	---
51A:									
Wheatbelt-------	D	None	---	---	---	---	Apr-Sep	Long	1.0
53D:									
Beaverton-------	B	None	---	---	>6.0	---	---	---	---
55A:									
Benz------------	C	None	---	---	>6.0	---	---	---	---
60A:									
Havre-----------	B	Rare	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
62C:									
Weingart--------	D	None	---	---	>6.0	---	---	---	---
Weingart, thin surface--------	D	None	---	---	>6.0	---	---	---	---
72F:									
Zahill----------	C	None	---	---	>6.0	---	---	---	---
74B:									
Marias----------	D	None	---	---	>6.0	---	---	---	---
75B:									
Farnuf----------	B	None	---	---	>6.0	---	---	---	---
75C:									
Farnuf----------	B	None	---	---	>6.0	---	---	---	---
76B:									
Bowery----------	B	None	---	---	>6.0	---	---	---	---
76C:									
Bowery----------	B	None	---	---	>6.0	---	---	---	---
76D:									
Bowery----------	B	None	---	---	>6.0	---	---	---	---
78A:									
Lostriver-------	C	Rare	---	---	>6.0	---	---	---	---
79B:									
Yamacall--------	B	None	---	---	>6.0	---	---	---	---
81A:									
Glendive--------	B	Rare	---	---	>6.0	---	---	---	---
84A:									
Bullhook--------	C	Rare	---	---	>6.0	---	---	---	---
90A:									
Harlake---------	C	Rare	---	---	>6.0	---	---	---	---
92B:									
Marmarth--------	C	None	---	---	>6.0	---	---	---	---
93D:									
Tally-----------	B	None	---	---	>6.0	---	---	---	---
96B:									
Fortbenton------	C	None	---	---	>6.0	---	---	---	---
96C:									
Fortbenton------	C	None	---	---	>6.0	---	---	---	---
98B:									
Kremlin---------	B	None	---	---	>6.0	---	---	---	---
99A:									
Thibadeau-------	C	Occasional	Brief	Apr-Jun	2.0-3.5	Apparent	Mar-Nov	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
110D:									
Laceycreek------	B	None	---	---	>6.0	---	---	---	---
115B:									
Thoeny----------	D	None	---	---	>6.0	---	---	---	---
Elloam----------	D	None	---	---	>6.0	---	---	---	---
171C:									
Delpoint--------	C	None	---	---	>6.0	---	---	---	---
Cabbart---------	D	None	---	---	>6.0	---	---	---	---
172C:									
Delpoint, calcareous-----	C	None	---	---	>6.0	---	---	---	---
Delpoint--------	C	None	---	---	>6.0	---	---	---	---
182F:									
Garlet----------	B	None	---	---	>6.0	---	---	---	---
Elkner----------	B	None	---	---	>6.0	---	---	---	---
191F:									
Winkler---------	B	None	---	---	>6.0	---	---	---	---
Ambrant---------	B	None	---	---	>6.0	---	---	---	---
Winkler, dry----	B	None	---	---	>6.0	---	---	---	---
200F:									
Badland.									
203F:									
Cabba-----------	D	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
204F:									
Cabba-----------	D	None	---	---	>6.0	---	---	---	---
Zahill----------	C	None	---	---	>6.0	---	---	---	---
205F:									
Cabba-----------	D	None	---	---	>6.0	---	---	---	---
Macar-----------	B	None	---	---	>6.0	---	---	---	---
211F:									
Cabbart---------	D	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
212F:									
Cabbart---------	D	None	---	---	>6.0	---	---	---	---
Hillon----------	C	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
213E:									
Cabbart----------	D	None	---	---	>6.0	---	---	---	---
Yawdim-----------	D	None	---	---	>6.0	---	---	---	---
221D:									
Hillon-----------	C	None	---	---	>6.0	---	---	---	---
Kevin------------	C	None	---	---	>6.0	---	---	---	---
224D:									
Hillon-----------	C	None	---	---	>6.0	---	---	---	---
Joplin-----------	C	None	---	---	>6.0	---	---	---	---
241A:									
Hanly------------	A	Occasional	Brief	Mar-Jun	>6.0	---	---	---	---
251D:									
Bascovy----------	D	None	---	---	>6.0	---	---	---	---
Neldore----------	D	None	---	---	>6.0	---	---	---	---
262A:									
Absher-----------	D	None	---	---	>6.0	---	---	---	---
Gerdrum----------	D	None	---	---	>6.0	---	---	---	---
272C:									
Attewan----------	B	None	---	---	>6.0	---	---	---	---
Tinsley----------	A	None	---	---	>6.0	---	---	---	---
304A:									
Marvan-----------	D	None	---	---	>6.0	---	---	---	---
Nobe-------------	D	None	---	---	>6.0	---	---	---	---
309A:									
Marvan, saline---	D	None	---	---	>6.0	---	---	---	---
Marvan-----------	D	None	---	---	>6.0	---	---	---	---
311B:									
Ferd-------------	C	None	---	---	>6.0	---	---	---	---
Creed------------	C	None	---	---	>6.0	---	---	---	---
Gerdrum----------	D	None	---	---	>6.0	---	---	---	---
321A:									
Kobase-----------	C	None	---	---	>6.0	---	---	---	---
331B:									
Phillips---------	C	None	---	---	>6.0	---	---	---	---
Elloam-----------	D	None	---	---	>6.0	---	---	---	---
334B:									
Phillips---------	C	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
334B: (cont.)									
Kevin-----------	C	None	---	---	>6.0	---	---	---	---
362C:									
Chinook---------	B	None	---	---	>6.0	---	---	---	---
Yetull----------	A	None	---	---	>6.0	---	---	---	---
375B:									
Evanston--------	B	None	---	---	>6.0	---	---	---	---
Lonna-----------	B	None	---	---	>6.0	---	---	---	---
381A:									
Ethridge--------	C	None	---	---	>6.0	---	---	---	---
400F:									
Rubble land.									
Rock outcrop.									
402A:									
Gerdrum---------	D	None	---	---	>6.0	---	---	---	---
Absher----------	D	None	---	---	>6.0	---	---	---	---
Creed-----------	C	None	---	---	>6.0	---	---	---	---
421C:									
Joplin----------	C	None	---	---	>6.0	---	---	---	---
Hillon----------	C	None	---	---	>6.0	---	---	---	---
441C:									
Kevin-----------	C	None	---	---	>6.0	---	---	---	---
Hillon----------	C	None	---	---	>6.0	---	---	---	---
442C:									
Kevin-----------	C	None	---	---	>6.0	---	---	---	---
Elloam----------	D	None	---	---	>6.0	---	---	---	---
501B:									
Telstad---------	C	None	---	---	>6.0	---	---	---	---
Hillon----------	C	None	---	---	>6.0	---	---	---	---
503B:									
Telstad---------	C	None	---	---	>6.0	---	---	---	---
Joplin----------	C	None	---	---	>6.0	---	---	---	---
503C:									
Telstad---------	C	None	---	---	>6.0	---	---	---	---
Joplin----------	C	None	---	---	>6.0	---	---	---	---
522A:									
Elloam----------	D	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
522A: (cont.)									
Absher----------	D	None	---	---	>6.0	---	---	---	---
530F:									
Warwood---------	B	None	---	---	>6.0	---	---	---	---
561B:									
Scobey----------	C	None	---	---	>6.0	---	---	---	---
Kevin-----------	C	None	---	---	>6.0	---	---	---	---
561C:									
Scobey----------	C	None	---	---	>6.0	---	---	---	---
Kevin-----------	C	None	---	---	>6.0	---	---	---	---
564B:									
Scobey----------	C	None	---	---	>6.0	---	---	---	---
Hillon----------	C	None	---	---	>6.0	---	---	---	---
571D:									
Chinook---------	B	None	---	---	>6.0	---	---	---	---
Cozberg---------	B	None	---	---	>6.0	---	---	---	---
Yetull----------	A	None	---	---	>6.0	---	---	---	---
573B:									
Cozberg---------	B	None	---	---	>6.0	---	---	---	---
Chinook---------	B	None	---	---	>6.0	---	---	---	---
603A:									
Havre-----------	B	Rare	---	---	>6.0	---	---	---	---
Harlake---------	C	Rare	---	---	>6.0	---	---	---	---
604A:									
Havre-----------	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
Glendive--------	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
611B:									
Hingham---------	B	None	---	---	>6.0	---	---	---	---
Lonna-----------	B	None	---	---	>6.0	---	---	---	---
661C:									
Twilight--------	B	None	---	---	>6.0	---	---	---	---
Blacksheep------	C	None	---	---	>6.0	---	---	---	---
671B:									
Bearpaw---------	C	None	---	---	>6.0	---	---	---	---
Vida------------	C	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
671C:									
Bearpaw----------	C	None	---	---	>6.0	---	---	---	---
Vida------------	C	None	---	---	>6.0	---	---	---	---
671D:									
Bearpaw----------	C	None	---	---	>6.0	---	---	---	---
Vida------------	C	None	---	---	>6.0	---	---	---	---
674B:									
Bearpaw----------	C	None	---	---	>6.0	---	---	---	---
Waltham----------	D	None	---	---	>6.0	---	---	---	---
696C:									
Vida------------	C	None	---	---	>6.0	---	---	---	---
Zahill----------	C	None	---	---	>6.0	---	---	---	---
Bearpaw----------	C	None	---	---	>6.0	---	---	---	---
701D:									
Yetull----------	A	None	---	---	>6.0	---	---	---	---
Busby-----------	B	None	---	---	>6.0	---	---	---	---
721E:									
Zahill----------	C	None	---	---	>6.0	---	---	---	---
Vida------------	C	None	---	---	>6.0	---	---	---	---
722D:									
Zahill----------	C	None	---	---	>6.0	---	---	---	---
Vida------------	C	None	---	---	>6.0	---	---	---	---
725F:									
Zahill----------	C	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
729F:									
Zahill----------	C	None	---	---	>6.0	---	---	---	---
Obrien----------	C	None	---	---	>6.0	---	---	---	---
732C:									
Yetull----------	A	None	---	---	>6.0	---	---	---	---
Lonesome--------	B	None	---	---	>6.0	---	---	---	---
761D:									
Hedoes----------	C	None	---	---	>6.0	---	---	---	---
Belain----------	C	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
761F:									
Hedoes----------	C	None	---	---	>6.0	---	---	---	---
Belain----------	C	None	---	---	>6.0	---	---	---	---
763E:									
Laceycreek------	B	None	---	---	>6.0	---	---	---	---
791C:									
Yamacall--------	B	None	---	---	>6.0	---	---	---	---
Hillon----------	C	None	---	---	>6.0	---	---	---	---
795C:									
Yamacall--------	B	None	---	---	>6.0	---	---	---	---
Benz------------	C	None	---	---	>6.0	---	---	---	---
799C:									
Yamacall--------	B	None	---	---	>6.0	---	---	---	---
801B:									
Williams--------	B	None	---	---	>6.0	---	---	---	---
Vida------------	C	None	---	---	>6.0	---	---	---	---
801C:									
Williams--------	B	None	---	---	>6.0	---	---	---	---
Vida------------	C	None	---	---	>6.0	---	---	---	---
812A:									
Glendive--------	B	Rare	---	---	>6.0	---	---	---	---
831A:									
Straw-----------	B	Rare	---	---	>6.0	---	---	---	---
Korchea---------	B	Rare	---	---	>6.0	---	---	---	---
832A:									
Nesda-----------	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
Nesda-----------	B	Rare	---	---	>6.0	---	---	---	---
833A:									
Enbar-----------	B	Occasional	Brief	Mar-Jun	3.0-5.0	Apparent	Apr-Jul	---	---
Straw-----------	B	Rare	---	---	>6.0	---	---	---	---
Eagleton--------	D	Occasional	Brief	Apr-Jun	1.0-2.0	Apparent	Nov-Jun	---	---
842A:									
Bullhook--------	C	Rare	---	---	>6.0	---	---	---	---
Nobe------------	D	Rare	---	---	4.0-6.0	Apparent	Dec-Jun	---	---
883F:									
Perma-----------	B	None	---	---	>6.0	---	---	---	---
Whitlash--------	D	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
892F:									
Whitlash--------	D	None	---	---	>6.0	---	---	---	---
Belain----------	C	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
895F:									
Whitlash--------	D	None	---	---	>6.0	---	---	---	---
Perma-----------	B	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
896F:									
Perma-----------	B	None	---	---	>6.0	---	---	---	---
Whitlash--------	D	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
899F:									
Zahill----------	C	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
Whitlash--------	D	None	---	---	>6.0	---	---	---	---
911F:									
Belain----------	C	None	---	---	>6.0	---	---	---	---
Whitlash--------	D	None	---	---	>6.0	---	---	---	---
Hedoes----------	C	None	---	---	>6.0	---	---	---	---
915F:									
Belain----------	C	None	---	---	>6.0	---	---	---	---
Whitlash--------	D	None	---	---	>6.0	---	---	---	---
Hedoes----------	C	None	---	---	>6.0	---	---	---	---
951B:									
Kenilworth------	C	None	---	---	>6.0	---	---	---	---
Fortbenton------	C	None	---	---	>6.0	---	---	---	---
962B:									
Fortbenton------	C	None	---	---	>6.0	---	---	---	---
965B:									
Fortbenton------	C	None	---	---	>6.0	---	---	---	---
Chinook---------	B	None	---	---	>6.0	---	---	---	---
968C:									
Fortbenton------	C	None	---	---	>6.0	---	---	---	---
Hillon----------	C	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
968D:									
Hillon----------	C	None	---	---	>6.0	---	---	---	---
Fortbenton------	C	None	---	---	>6.0	---	---	---	---
971F:									
Neldore---------	D	None	---	---	>6.0	---	---	---	---
Bascovy---------	D	None	---	---	>6.0	---	---	---	---
974F:									
Neldore---------	D	None	---	---	>6.0	---	---	---	---
Hillon----------	C	None	---	---	>6.0	---	---	---	---
DA: Denied access.									
M-W: Miscellaneous water.									
W: Water.									

Soil Features

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
13A:					
McKenzie	>60	---	Low	High	High
16B:					
Degrand	>60	---	Moderate	High	Low
22E:					
Hillon	>60	---	Moderate	High	Low
22F:					
Hillon	>60	---	Moderate	High	Low
24A:					
Hanly	>60	---	Low	Moderate	Low
27B:					
Attewan	>60	---	Moderate	High	Low
28A:					
Nishon	>60	---	Moderate	High	Low
30A:					
Marvan	>60	---	Low	High	Moderate
30C:					
Marvan	>60	---	Low	High	Moderate
31A:					
Ferd	>60	---	Low	High	Low
32A:					
Kobase	>60	---	Low	High	Low
33A:					
Phillips	>60	---	Low	High	Low
34A:					
Dimmick	>60	---	Moderate	High	Low
36A:					
Chinook	>60	---	Moderate	High	Low
36C:					
Chinook	>60	---	Moderate	High	Low
37A:					
Evanston	>60	---	Moderate	High	Low
51A:					
Wheatbelt	>60	---	Low	High	Low
53D:					
Beaverton	>60	---	Moderate	High	Low
55A:					
Benz	>60	---	Moderate	High	Low
60A:					
Havre	>60	---	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
62C:					
Weingart, thin surface--------	20-40	Soft	Low	High	Moderate
Weingart--------	20-40	Soft	Low	High	Moderate
72F:					
Zahill----------	>60	---	Moderate	High	Low
74B:					
Marias----------	>60	---	Low	High	Low
75B:					
Farnuf----------	>60	---	Moderate	High	Low
75C:					
Farnuf----------	>60	---	Moderate	High	Low
76B:					
Bowery----------	>60	---	Moderate	High	Moderate
76C:					
Bowery----------	>60	---	Moderate	High	Moderate
76D:					
Bowery----------	>60	---	Moderate	High	Moderate
78A:					
Lostriver-------	>60	---	Low	High	Moderate
79B:					
Yamacall--------	>60	---	Moderate	High	Low
81A:					
Glendive--------	>60	---	Moderate	High	Low
84A:					
Bullhook--------	>60	---	Moderate	High	Moderate
90A:					
Harlake---------	>60	---	Low	High	Low
92B:					
Marmarth--------	20-40	Soft	Moderate	High	Low
93D:					
Tally-----------	>60	---	Moderate	High	Low
96B:					
Fortbenton------	>60	---	Moderate	High	Low
96C:					
Fortbenton------	>60	---	Moderate	High	Low
98B:					
Kremlin---------	>60	---	Moderate	High	Low
99A:					
Thibadeau-------	>60	---	Moderate	High	Moderate

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
110D:					
Laceycreek------	>60	---	Moderate	High	Low
115B:					
Thoeny----------	>60	---	Low	High	Moderate
Elloam----------	>60	---	Low	High	High
171C:					
Delpoint--------	20-40	Soft	Moderate	High	Low
Cabbart---------	10-20	Soft	Moderate	High	Low
172C:					
Delpoint, calcareous-----	20-40	Soft	Moderate	High	Low
Delpoint--------	20-40	Soft	Moderate	High	Low
182F:					
Garlet----------	>60	---	Moderate	Moderate	Moderate
Elkner----------	>60	---	Moderate	Moderate	Moderate
191F:					
Winkler---------	>60	---	Moderate	Moderate	Moderate
Ambrant---------	>60	---	Moderate	Moderate	Moderate
Winkler, dry----	>60	---	Moderate	Moderate	Moderate
200F:					
Badland.					
203F:					
Cabba-----------	10-20	Soft	Moderate	High	Low
Rock outcrop.					
204F:					
Cabba-----------	10-20	Soft	Moderate	High	Low
Zahill----------	>60	---	Moderate	High	Low
205F:					
Cabba-----------	10-20	Soft	Moderate	High	Low
Macar-----------	>60	---	Moderate	High	Low
211F:					
Cabbart---------	10-20	Soft	Moderate	High	Low
Rock outcrop.					
212F:					
Cabbart---------	10-20	Soft	Moderate	High	Low
Hillon----------	>60	---	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
213E:					
Cabbart	10-20	Soft	Moderate	High	Low
Yawdim	10-20	Soft	Low	High	Low
221D:					
Hillon	>60	---	Moderate	High	Low
Kevin	>60	---	Moderate	High	Low
224D:					
Hillon	>60	---	Moderate	High	Low
Joplin	>60	---	Moderate	High	Low
241A:					
Hanly	>60	---	Low	Moderate	Low
251D:					
Bascovy	20-40	Soft	Low	High	High
Neldore	10-20	Soft	Low	High	Moderate
262A:					
Absher	>60	---	Low	High	Moderate
Gerdrum	>60	---	Low	High	Moderate
272C:					
Attewan	>60	---	Moderate	High	Low
Tinsley	>60	---	Low	High	Low
304A:					
Marvan	>60	---	Low	High	Moderate
Nobe	>60	---	Low	High	High
309A:					
Marvan	>60	---	Low	High	Moderate
Marvan, saline	>60	---	Low	High	Moderate
311B:					
Ferd	>60	---	Low	High	Low
Creed	>60	---	Low	High	Moderate
Gerdrum	>60	---	Low	High	Moderate
321A:					
Kobase	>60	---	Low	High	Low
331B:					
Phillips	>60	---	Low	High	Low
Elloam	>60	---	Low	High	High
334B:					
Phillips	>60	---	Low	High	Low
Kevin	>60	---	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In				
362C:					
Chinook	>60	---	Moderate	High	Low
Yetull	>60	---	Low	High	Low
375B:					
Evanston	>60	---	Moderate	High	Low
Lonna	>60	---	Moderate	High	Low
381A:					
Ethridge	>60	---	Low	High	Low
400F:					
Rubble land.					
Rock outcrop.					
402A:					
Gerdrum	>60	---	Low	High	Moderate
Absher	>60	---	Low	High	Moderate
Creed	>60	---	Low	High	Moderate
421C:					
Joplin	>60	---	Moderate	High	Low
Hillon	>60	---	Moderate	High	Low
441C:					
Kevin	>60	---	Moderate	High	Low
Hillon	>60	---	Moderate	High	Low
442C:					
Kevin	>60	---	Moderate	High	Low
Elloam	>60	---	Low	High	High
501B:					
Telstad	>60	---	Low	High	Low
Hillon	>60	---	Moderate	High	Low
503B:					
Telstad	>60	---	Low	High	Low
Joplin	>60	---	Moderate	High	Low
503C:					
Telstad	>60	---	Low	High	Low
Joplin	>60	---	Moderate	High	Low
522A:					
Elloam	>60	---	Low	High	High
Absher	>60	---	Low	High	Moderate
530F:					
Warwood	>60	---	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
561B:					
Scobey----------	>60	---	Low	High	Low
Kevin-----------	>60	---	Moderate	High	Low
561C:					
Scobey----------	>60	---	Low	High	Low
Kevin-----------	>60	---	Moderate	High	Low
564B:					
Scobey----------	>60	---	Low	High	Low
Hillon----------	>60	---	Moderate	High	Low
571D:					
Chinook---------	>60	---	Moderate	High	Low
Cozberg---------	>60	---	Moderate	High	Low
Yetull----------	>60	---	Low	High	Low
573B:					
Cozberg---------	>60	---	Moderate	High	Low
Chinook---------	>60	---	Moderate	High	Low
603A:					
Havre-----------	>60	---	Moderate	High	Low
Harlake---------	>60	---	Low	High	Low
604A:					
Havre-----------	>60	---	Moderate	High	Low
Glendive--------	>60	---	Moderate	High	Low
611B:					
Hingham---------	>60	---	Moderate	High	Low
Lonna-----------	>60	---	Moderate	High	Low
661C:					
Twilight--------	20-40	Soft	Moderate	High	Low
Blacksheep------	10-20	Soft	Moderate	High	Low
671B:					
Bearpaw---------	>60	---	Moderate	High	Moderate
Vida------------	>60	---	Moderate	High	Low
671C:					
Bearpaw---------	>60	---	Moderate	High	Moderate
Vida------------	>60	---	Moderate	High	Low
671D:					
Bearpaw---------	>60	---	Moderate	High	Moderate
Vida------------	>60	---	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In				
674B:					
Bearpaw----------	>60	---	Moderate	High	Moderate
Waltham----------	>60	---	Low	High	High
696C:					
Vida-------------	>60	---	Moderate	High	Low
Zahill-----------	>60	---	Moderate	High	Low
Bearpaw----------	>60	---	Moderate	High	Moderate
701D:					
Yetull-----------	>60	---	Low	High	Low
Busby------------	>60	---	Moderate	High	Low
721E:					
Zahill-----------	>60	---	Moderate	High	Low
Vida-------------	>60	---	Moderate	High	Low
722D:					
Zahill-----------	>60	---	Moderate	High	Low
Vida-------------	>60	---	Moderate	High	Low
725F:					
Zahill-----------	>60	---	Moderate	High	Low
Rock outcrop.					
729F:					
Zahill-----------	>60	---	Moderate	High	Low
Obrien-----------	>60	---	Moderate	High	Low
732C:					
Yetull-----------	>60	---	Low	High	Low
Lonesome---------	>60	---	Moderate	High	Low
761D:					
Hedoes-----------	>60	---	Moderate	High	Low
Belain-----------	20-40	Hard	Moderate	High	Low
761F:					
Hedoes-----------	>60	---	Moderate	High	Low
Belain-----------	20-40	Hard	Moderate	High	Low
763E:					
Laceycreek-------	>60	---	Moderate	High	Low
791C:					
Yamacall---------	>60	---	Moderate	High	Low
Hillon-----------	>60	---	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In				
795C:					
Yamacall	>60	---	Moderate	High	Low
Benz	>60	---	Moderate	High	Low
799C:					
Yamacall	>60	---	Moderate	High	Low
801B:					
Williams	>60	---	Moderate	High	Low
Vida	>60	---	Moderate	High	Low
801C:					
Williams	>60	---	Moderate	High	Low
Vida	>60	---	Moderate	High	Low
812A:					
Glendive	>60	---	Moderate	High	Low
831A:					
Straw	>60	---	Moderate	High	Low
Korchea	>60	---	Moderate	High	Low
832A:					
Nesda	>60	---	Low	High	Low
Nesda	>60	---	Low	High	Low
833A:					
Enbar	>60	---	High	High	Low
Straw	>60	---	Moderate	High	Low
Eagleton	>60	---	High	High	Low
842A:					
Bullhook	>60	---	Moderate	High	Moderate
Nobe	>60	---	Low	High	High
883F:					
Perma	>60	---	Moderate	Moderate	Low
Whitlash	10-20	Hard	Moderate	High	Low
892F:					
Whitlash	10-20	Hard	Moderate	High	Low
Belain	20-40	Hard	Moderate	High	Low
Rock outcrop.					
895F:					
Whitlash	10-20	Hard	Moderate	High	Low
Perma	>60	---	Moderate	Moderate	Low
Rock outcrop.					

Soil Features--Continued

Map symbol and soil name	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In				
896F:					
Perma-----------	>60	---	Moderate	Moderate	Low
Whitlash--------	10-20	Hard	Moderate	High	Low
Rock outcrop.					
899F:					
Zahill----------	>60	---	Moderate	High	Low
Rock outcrop.					
Whitlash--------	10-20	Hard	Moderate	High	Low
911F:					
Belain----------	20-40	Hard	Moderate	High	Low
Whitlash--------	10-20	Hard	Moderate	High	Low
Hedoes----------	>60	---	Moderate	High	Low
915F:					
Belain----------	20-40	Hard	Moderate	High	Low
Whitlash--------	10-20	Hard	Moderate	High	Low
Hedoes----------	>60	---	Moderate	High	Low
951B:					
Kenilworth------	>60	---	Moderate	High	Low
Fortbenton------	>60	---	Moderate	High	Low
962B:					
Fortbenton------	>60	---	Moderate	High	Low
965B:					
Fortbenton------	>60	---	Moderate	High	Low
Chinook---------	>60	---	Moderate	High	Low
968C:					
Fortbenton------	>60	---	Moderate	High	Low
Hillon----------	>60	---	Moderate	High	Low
968D:					
Hillon----------	>60	---	Moderate	High	Low
Fortbenton------	>60	---	Moderate	High	Low
971F:					
Neldore---------	10-20	Soft	Low	High	Moderate
Bascovy---------	20-40	Soft	Low	High	High
974F:					
Neldore---------	10-20	Soft	Low	High	Moderate
Hillon----------	>60	---	Moderate	High	Low

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
DA:					
Denied access.					
M-W:					
Miscellaneous water.					
W:					
Water.					

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hill slopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillite. Weakly metamorphosed mudstone or shale.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.75
Low	3.75 to 5.0
Moderate	5.0 to 7.5
High	more than 7.5

Avalanche chute. The track or path formed by an avalanche.

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep or very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, a felled tree generally is reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation by use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Cirque. A semicircular, concave, bowllike area that has steep faces primarily resulting from erosive activity of a mountain glacier.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from the adjacent stands.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent cobbles, and extremely cobbly soil material is more than 60 percent cobbles.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forest land capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse grained, clastic rock composed of rounded to subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion; in areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very

hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called culmination of mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming with the dip of underlying bedded rock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit the use of a full stripcropping pattern.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly have a layer with low

hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between individual trees. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. A firebreak also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the stream.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothills. A region of relatively low, rounded hills at the base of a mountain range.

Foot slope. The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface profile is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Giant ripple mark. The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. A gullied map unit is one that has numerous gullies.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the number 2 precedes the letter C.

Cr horizon.—Sedimentary beds of consolidated sandstone and semiconsolidated and

consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.
R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and are less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lateral moraine. A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low-residue crops. Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Mean annual increment (MAI). The average annual increase in volume of a tree during the entire life of the tree.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Miscellaneous water. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine. An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of limited summit area and generally having steep sides (slopes greater than 25 percent) and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by deep-seated earth movements or volcanic action and secondarily by differential erosion.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata mainly red in color and composed largely of sandstone and shale.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	more than 16

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder slope. The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the county.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Tailwater. The water directly downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive arcuate ridge or complex of ridges underlain by till and other types of drift.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water-spreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

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INDEX TO MAP SHEETS

HILL COUNTY, MONTANA

Scale 1:380,160

1 0 1 2 3 4 5 6 Miles

10 0 5 10 Km

SOIL LEGEND

The publication symbols consist of field symbols. Symbols consist of numbers or a combination of numbers and letters, for example, 10C, 241B, 600, and 1400F. For the symbols designated by a number and letter, the number designates the soil type and the letter designates the slope class. Map units are arranged numerically

SYMBOL	NAME
13A	McKenzie clay, 0 to 1 percent slopes
16B	Degrand loam, 0 to 4 percent slopes
22E	Hillon loam, 15 to 25 percent slopes
22F	Hillon loam, 25 to 60 percent slopes
24A	Hanly loamy fine sand, 0 to 2 percent slopes
27B	Attewan loam, 0 to 4 percent slopes
28A	Nishon clay loam, 0 to 1 percent slopes
30A	Marvan clay, 0 to 2 percent slopes
30C	Marvan clay, 2 to 8 percent slopes
31A	Ferd loam, 0 to 2 percent slopes
32A	Kobase clay loam, 0 to 2 percent slopes
33A	Phillips loam, 0 to 2 percent slopes
34A	Dimmick clay, 0 to 1 percent slopes
36A	Chinook fine sandy loam, 0 to 2 percent slopes
36C	Chinook fine sandy loam, 2 to 8 percent slopes
37A	Evanston loam, 0 to 2 percent slopes
51A	Wheatbelt clay, 0 to 1 percent slopes
53D	Beaverton gravelly loam, 4 to 15 percent slopes
55A	Benz clay loam, 0 to 2 percent slopes
60A	Havre loam, 0 to 2 percent slopes
62C	Weingart complex, 2 to 8 percent slopes
72F	Zahill clay loam, 25 to 60 percent slopes
74B	Marias silty clay, 0 to 4 percent slopes
75B	Farnuf loam, 0 to 4 percent slopes
75C	Farnuf loam, 4 to 8 percent slopes
76B	Bowery loam, 0 to 4 percent slopes
76C	Bowery loam, 4 to 8 percent slopes
76D	Bowery loam, 8 to 15 percent slopes
78A	Lostriver clay, 0 to 2 percent slopes
79B	Yamacall loam, 0 to 4 percent slopes
81A	Glendive fine sandy loam, 0 to 2 percent slopes
84A	Bullhook clay loam, 0 to 2 percent slopes
90A	Harlake clay, 0 to 2 percent slopes
92B	Marmarth loam, 0 to 4 percent slopes
93D	Tally fine sandy loam, 4 to 15 percent slopes
96B	Fortbenton fine sandy loam, 0 to 4 percent slopes
96C	Fortbenton fine sandy loam, 4 to 8 percent slopes
98B	Kremlin loam, 0 to 4 percent slopes
99A	Thibadeau clay loam, 0 to 2 percent slopes
110D	Laceycreek loam, 8 to 15 percent slopes
115B	Thoeny-Elloam complex, 0 to 4 percent slopes
171C	Delpoint-Cabbart loams, 2 to 8 percent slopes
172C	Delpoint complex, 2 to 8 percent slopes
182F	Garlet-Elkner complex, 25 to 70 percent slopes
191F	Winkler-Ambrant complex, 25 to 60 percent slopes
200F	Badland
203F	Cabba-Rock outcrop complex, 25 to 60 percent slopes
204F	Cabba-Zahill complex, 25 to 60 percent slopes
205F	Cabba-Macar loams, 15 to 60 percent slopes
211F	Cabbart-Rock outcrop complex, 25 to 60 percent slopes
212F	Cabbart-Hillon loams, 25 to 60 percent slopes
213E	Cabbart-Yawdim complex, 8 to 25 percent slopes
221D	Hillon-Kevin clay loams, 8 to 15 percent slopes
224D	Hillon-Joplin loams, 8 to 15 percent slopes
241A	Hanly loamy fine sand, 0 to 2 percent slopes, occasionally flooded
251D	Bascovy-Neldore clays, 2 to 15 percent slopes
262A	Absher-Gerdrum complex, 0 to 2 percent slopes
272C	Attewan-Tinsley complex, 2 to 8 percent slopes
304A	Marvan-Nobe clays, 0 to 2 percent slopes
309A	Marvan complex, 0 to 2 percent slopes
311B	Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes
321A	Kobase clay loam, calcareous, 0 to 2 percent slopes
331B	Phillips-Elloam complex, 0 to 4 percent slopes
334B	Phillips-Kevin complex, 0 to 4 percent slopes

SYMBOL	NAME
362C	Chinook-Yetull complex, 2 to 10 percent slopes
375B	Evanston-Lonna loams, 0 to 4 percent slopes
381A	Ethridge clay loam, 0 to 2 percent slopes
400F	Rubble land-Rock outcrop complex
402A	Gerdrum-Absher-Creed complex, 0 to 2 percent slopes
421C	Joplin-Hillon loams, 2 to 8 percent slopes
441C	Kevin-Hillon clay loams, 2 to 8 percent slopes
442C	Kevin-Elloam clay loams, 2 to 8 percent slopes
501B	Telstad-Hillon loams, 0 to 4 percent slopes
503B	Telstad-Joplin loams, 0 to 4 percent slopes
503C	Telstad-Joplin loams, 4 to 8 percent slopes
522A	Elloam-Absher complex, 0 to 2 percent slopes
530F	Warwood loam, 15 to 45 percent slopes
561B	Scobey-Kevin clay loams, 0 to 4 percent slopes
561C	Scobey-Kevin clay loams, 4 to 8 percent slopes
564B	Scobey-Hillon clay loams, 0 to 4 percent slopes
571D	Chinook-Cozberg-Yetull fine sandy loams, 4 to 15 percent slopes
573B	Cozberg-Chinook fine sandy loams, 0 to 4 percent slopes
603A	Havre-Harlake clay loams, 0 to 2 percent slopes
604A	Havre-Glendive complex, 0 to 2 percent slopes
611B	Hingham-Lonna loams, 0 to 4 percent slopes
661C	Twilight-Blacksheep fine sandy loams, 2 to 8 percent slopes
671B	Bearpaw-Vida clay loams, 0 to 4 percent slopes
671C	Bearpaw-Vida clay loams, 4 to 8 percent slopes
671D	Bearpaw-Vida clay loams, 8 to 15 percent slopes
674B	Bearpaw-Waltham clay loams, 0 to 4 percent slopes
696C	Vida-Zahill-Bearpaw clay loams, 2 to 8 percent slopes
701D	Yetull-Busby fine sandy loams, 4 to 15 percent slopes
721E	Zahill-Vida clay loams, 15 to 25 percent slopes
722D	Zahill-Vida clay loams, 8 to 15 percent slopes
725F	Zahill-Rock outcrop complex, 25 to 60 percent slopes
729F	Zahill-Obrien clay loams, 15 to 60 percent slopes
732C	Yetull-Lonesome loamy fine sands, 0 to 8 percent slopes
761D	Hedoes-Belain loams, 4 to 15 percent slopes
761F	Hedoes-Belain loams, 15 to 35 percent slopes
763E	Laceycreek loam, moist, 8 to 25 percent slopes
791C	Yamacall-Hillon loams, 2 to 8 percent slopes
795C	Yamacall-Benz clay loams, 2 to 8 percent slopes
799C	Yamacall clay loam, 2 to 8 percent slopes
801B	Williams-Vida loams, 0 to 4 percent slopes
801C	Williams-Vida loams, 4 to 8 percent slopes
812A	Glendive fine sandy loam, calcareous, 0 to 2 percent slopes
831A	Straw-Korchea loams, 0 to 2 percent slopes
832A	Nesda complex, 0 to 2 percent slopes
833A	Enbar-Straw-Eagleton loams, 0 to 2 percent slopes
842A	Bullhook-Nobe complex, 0 to 2 percent slopes
883F	Perma-Whitlash complex, 25 to 70 percent slopes
892F	Whitlash-Belain-Rock outcrop complex, 25 to 60 percent slopes
895F	Whitlash-Perma-Rock outcrop complex, 25 to 70 percent slopes
896F	Perma-Whitlash, cool-Rock outcrop complex, 25 to 70 percent slopes
899F	Zahill-Rock outcrop-Whitlash complex, 15 to 60 percent slopes
911F	Belain-Whitlash, moist-Hedoes complex, 15 to 60 percent slopes
915F	Belain-Whitlash-Hedoes complex, 15 to 45 percent slopes
951B	Kenilworth-Fortbenton fine sandy loams, 0 to 4 percent slopes
962B	Fortbenton loam, 0 to 4 percent slopes
965B	Fortbenton-Chinook fine sandy loams, 0 to 6 percent slopes
968C	Fortbenton-Hillon complex, 2 to 8 percent slopes
968D	Hillon-Fortbenton complex, 8 to 25 percent slopes
971F	Neldore-Bascovy silty clays, 25 to 60 percent slopes
974F	Neldore-Hillon complex, 25 to 70 percent slopes
DA	Denied access
M-W	Miscellaneous water
W	Water

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Reservation (national forest or park, state forest or park, and large airport)
- Field sheet matchline and neatline

LAND DIVISION CORNER (sections and land grants)

GEOGRAPHIC COORDINATE TICK

ROAD EMBLEM & DESIGNATIONS

- Federal — 287
- State — 52

PITS

- Gravel pit

WATER FEATURES

LAKES, PONDS AND RESERVOIRS

- Perennial water
- Miscellaneous water

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 224D 503B

ESCARPMENTS

- Other than bedrock (points down slope)

SHORT STEEP SLOPE

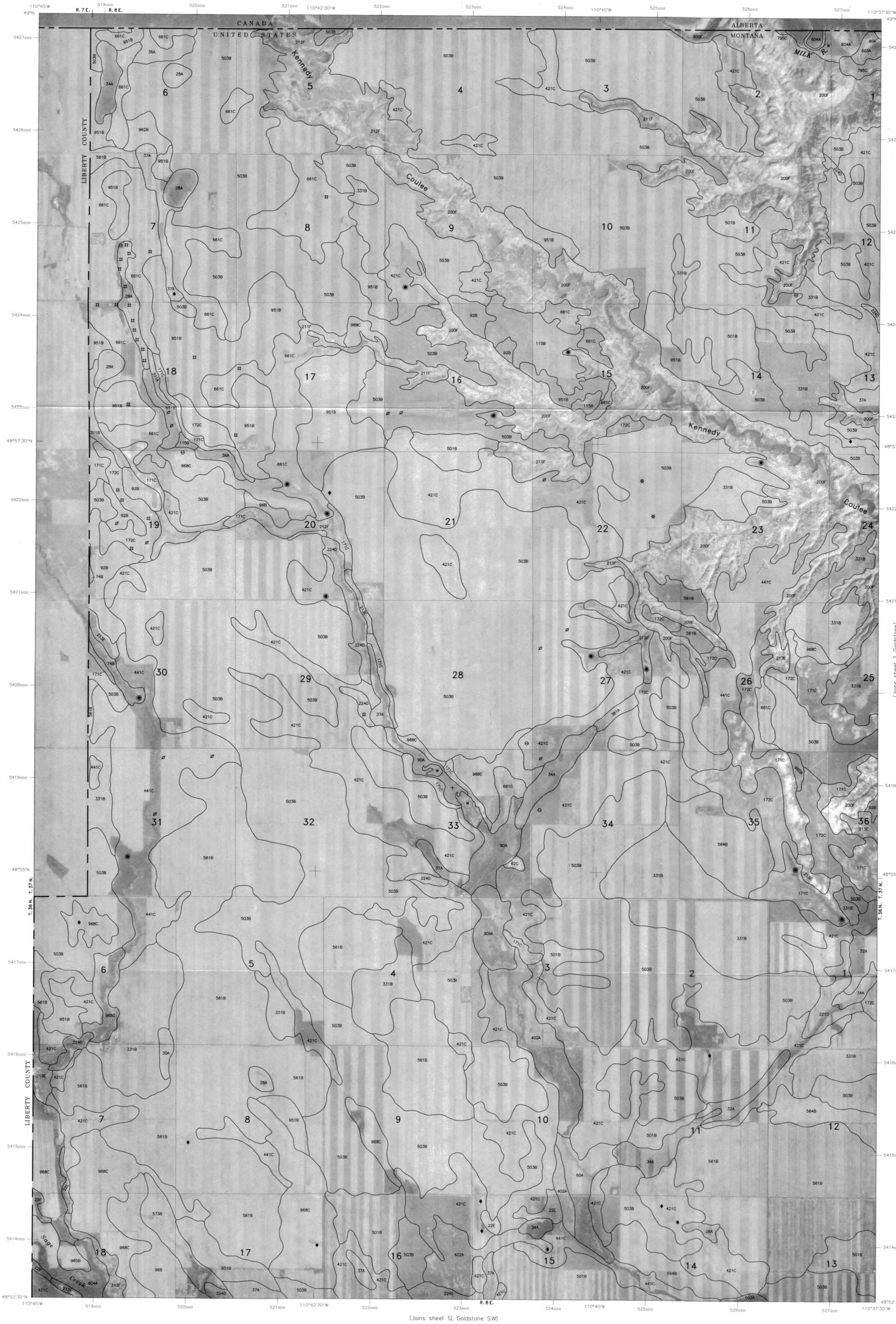
DEPRESSION, closed

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Sodic spot
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Stony spot, very stony spot
- Windblown sand deposits (< 5 acres)
- Rubbleland (< 5 acres)
- Shallow soils (< 5 acres)
- Seep areas (< 5 acres)
- Calcareous spot

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
LAIRD LAKE QUADRANGLE
SHEET NUMBER 1
7.5 MINUTE SERIES



1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

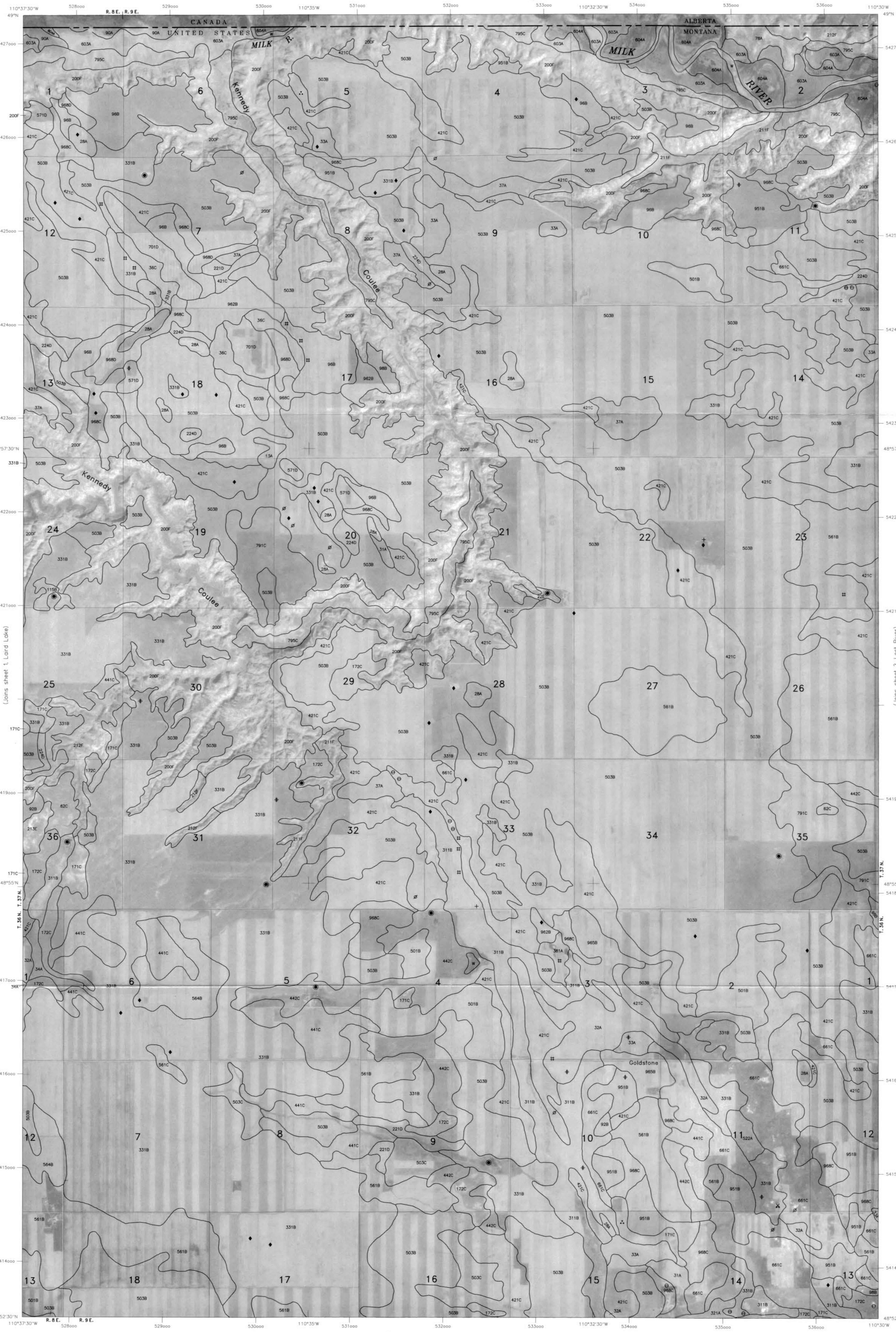
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 1 OF 71
HILL COUNTY, MONTANA
LAIRD LAKE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA

GOLDSTONE QUADRANGLE
SHEET NUMBER 2
7.5 MINUTE SERIES



(Joins sheet 1, Laird Lake)

(Joins sheet 3, Lost River)

(Joins sheet 13, McKinnsey Reservoir West)

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1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 2 OF 71
HILL COUNTY, MONTANA
GOLDSTONE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
LOST RIVER QUADRANGLE
SHEET NUMBER 3
7.5 MINUTE SERIES

(Joins sheet 14, McKinnsey Reservoir East)

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1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 3 OF 71
HILL COUNTY, MONTANA
LOST RIVER QUADRANGLE

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

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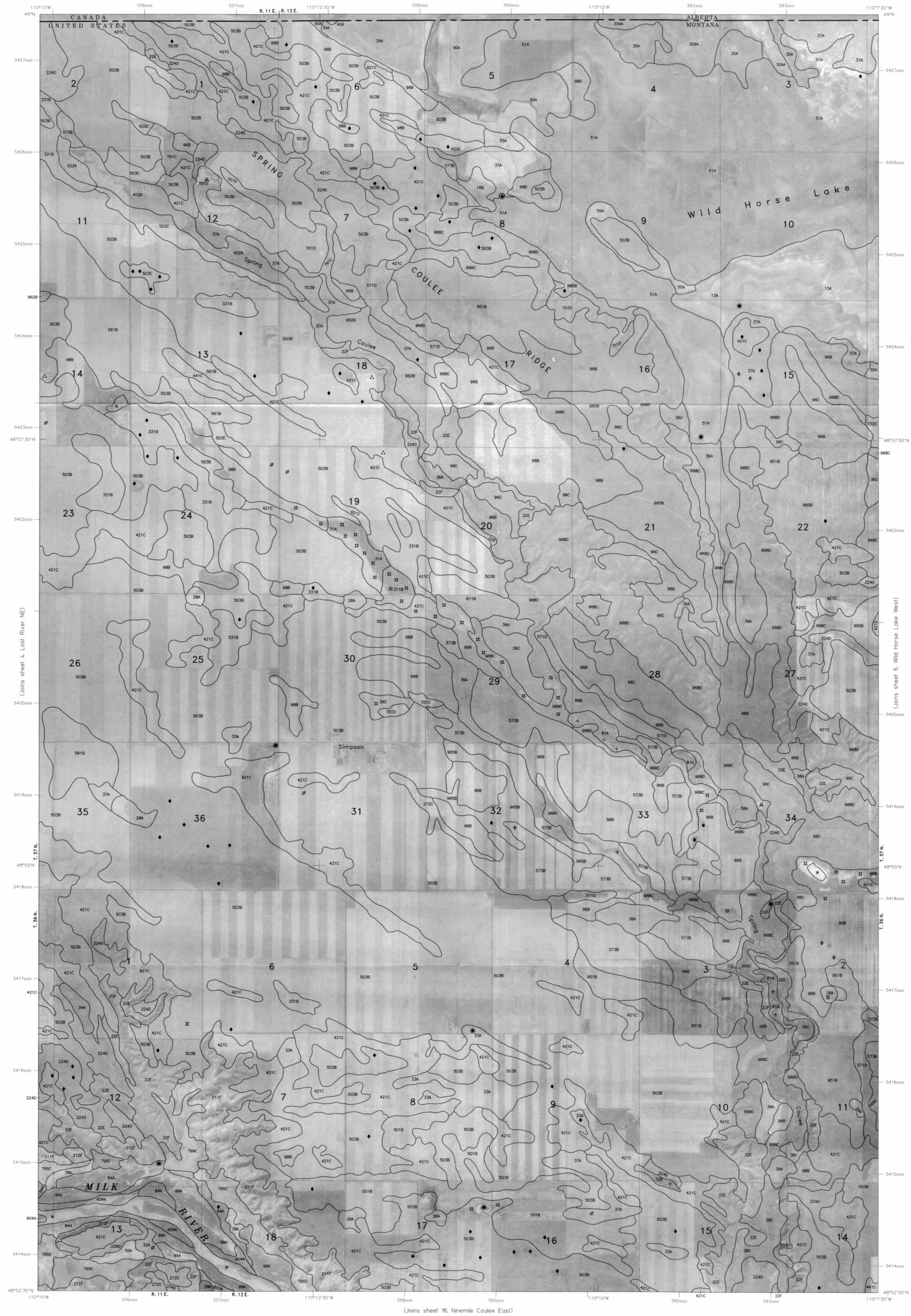
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 4 OF 71
HILL COUNTY, MONTANA
LOST RIVER NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE



(Joins sheet 16, Ninemile Coulee East)

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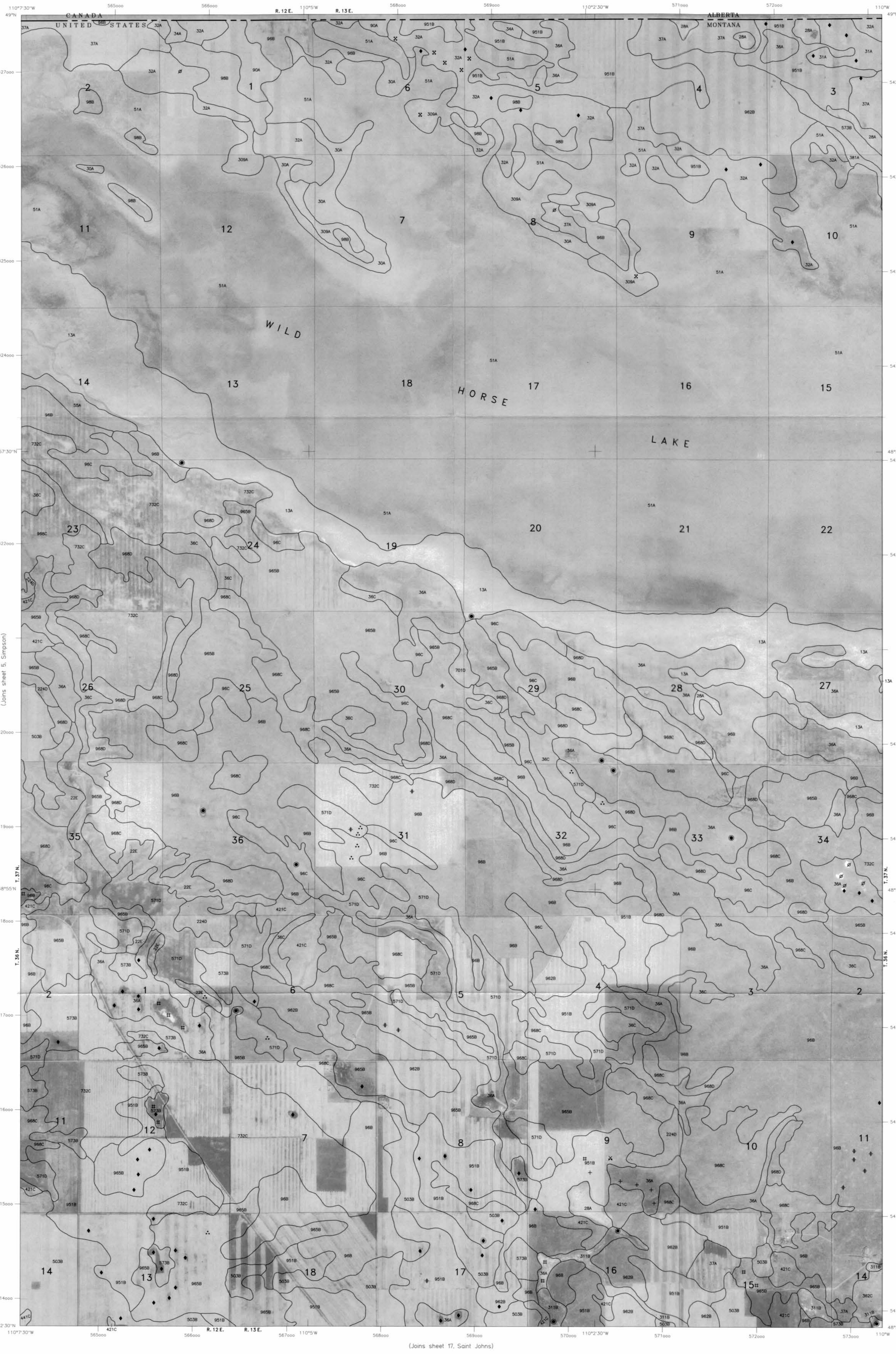
1 MILE
7000 FEET
1 KILOMETER
Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 5 OF 71
HILL COUNTY, MONTANA
SIMPSON QUADRANGLE



1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

N

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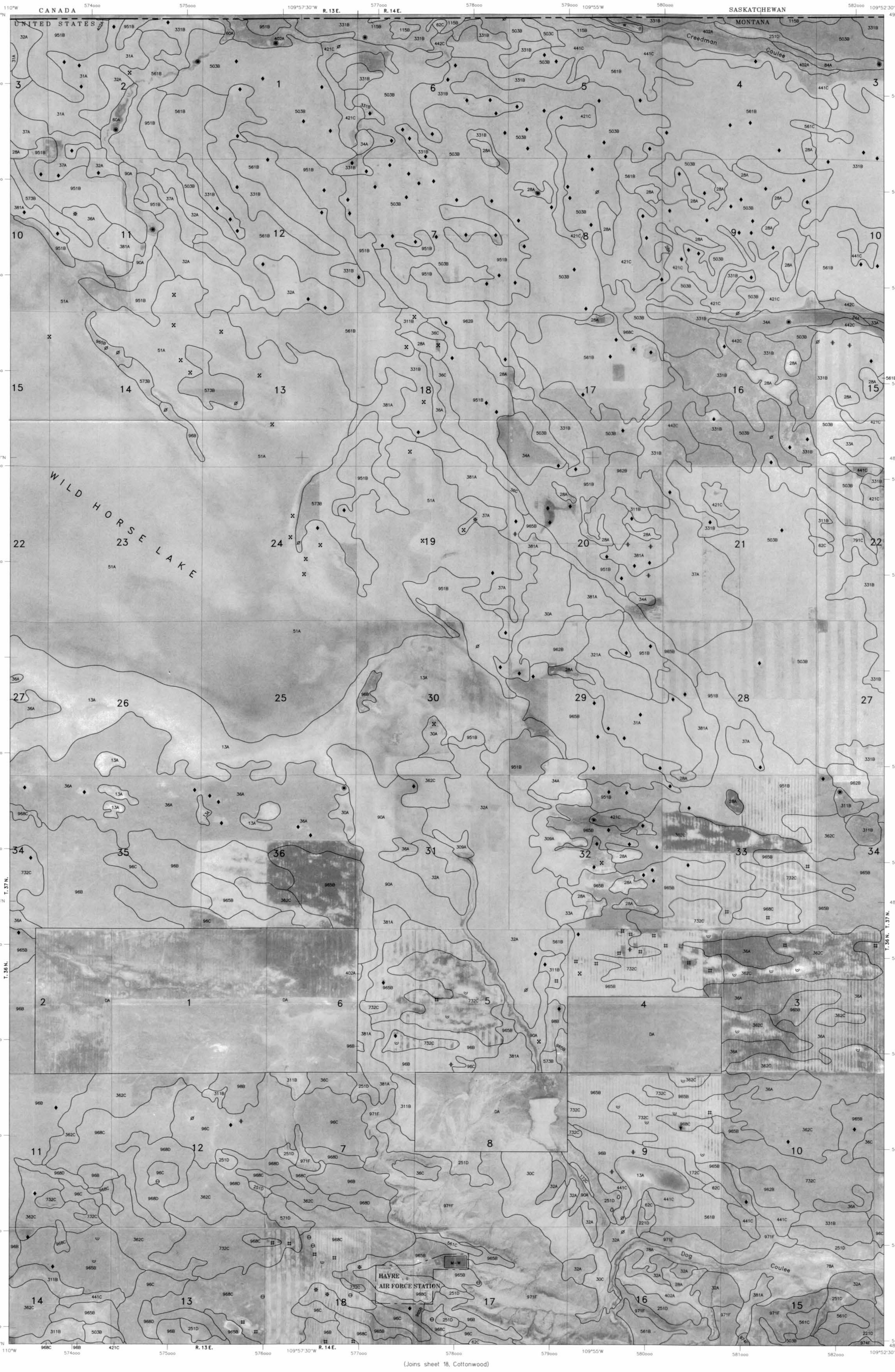
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 6 OF 71
HILL COUNTY, MONTANA
WILD HORSE LAKE WEST QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
WILD HORSE LAKE EAST QUADRANGLE
SHEET NUMBER 7
7.5 MINUTE SERIES



1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 7 OF 71
HILL COUNTY, MONTANA
WILD HORSE LAKE EAST QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

N

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Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 8 OF 71
HILL COUNTY, MONTANA
CREEDMAN COULEE WEST QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 8, Creedman Coulee West)

(Joins sheet 10, Lake Thibadeau NE)

(Joins sheet 20, Lake Thibadeau SW)

Scale 1:24000

N

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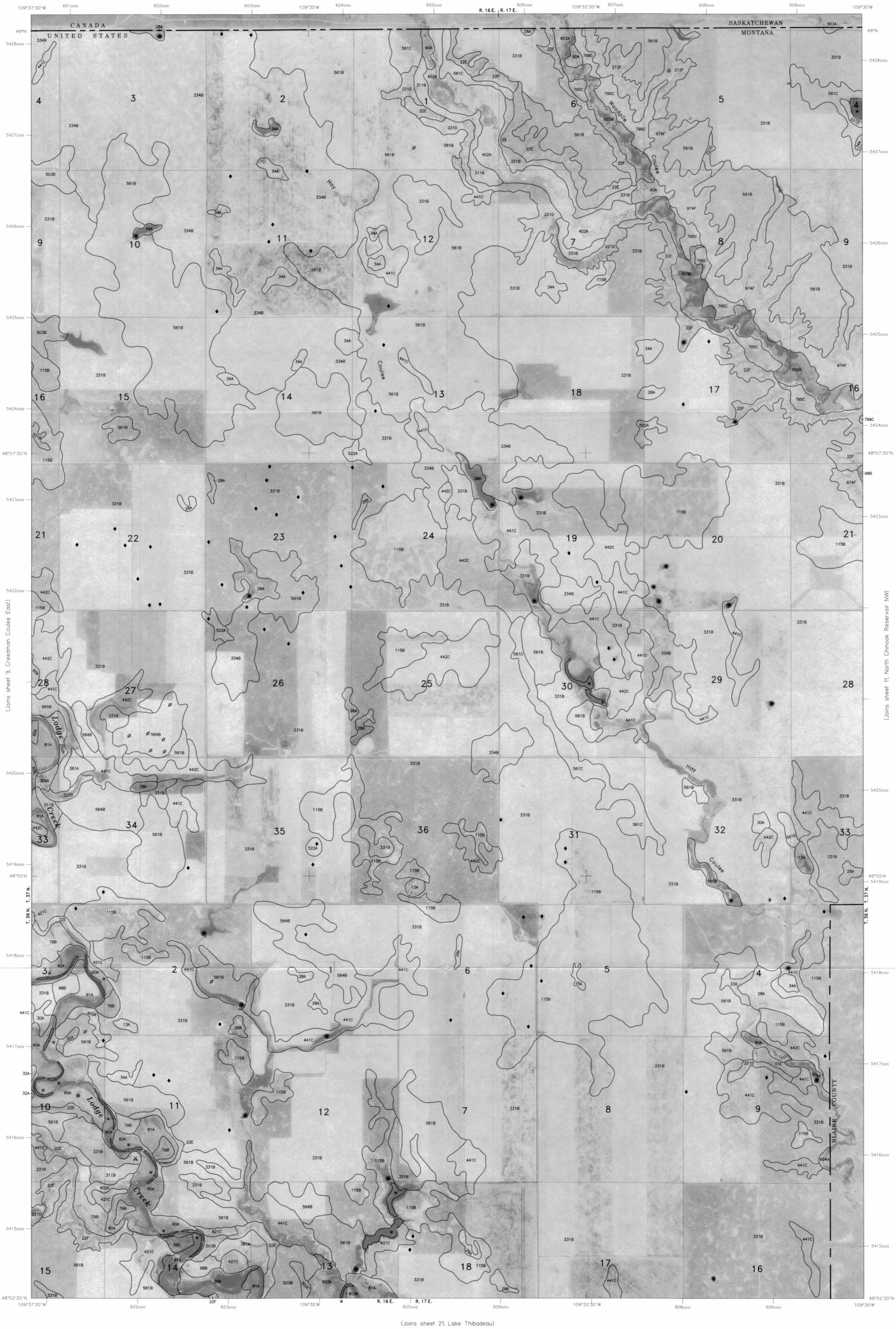
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 9 OF 71
HILL COUNTY, MONTANA
CREEDMAN COULEE EAST QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE



(Joins sheet 21, Lake Thibadeau)

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 10 OF 71
HILL COUNTY, MONTANA
LAKE THIBADEAU NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
NORTH CHINOOK RESERVOIR NW QUADRANGLE
SHEET NUMBER 11
7.5 MINUTE SERIES

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974—1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

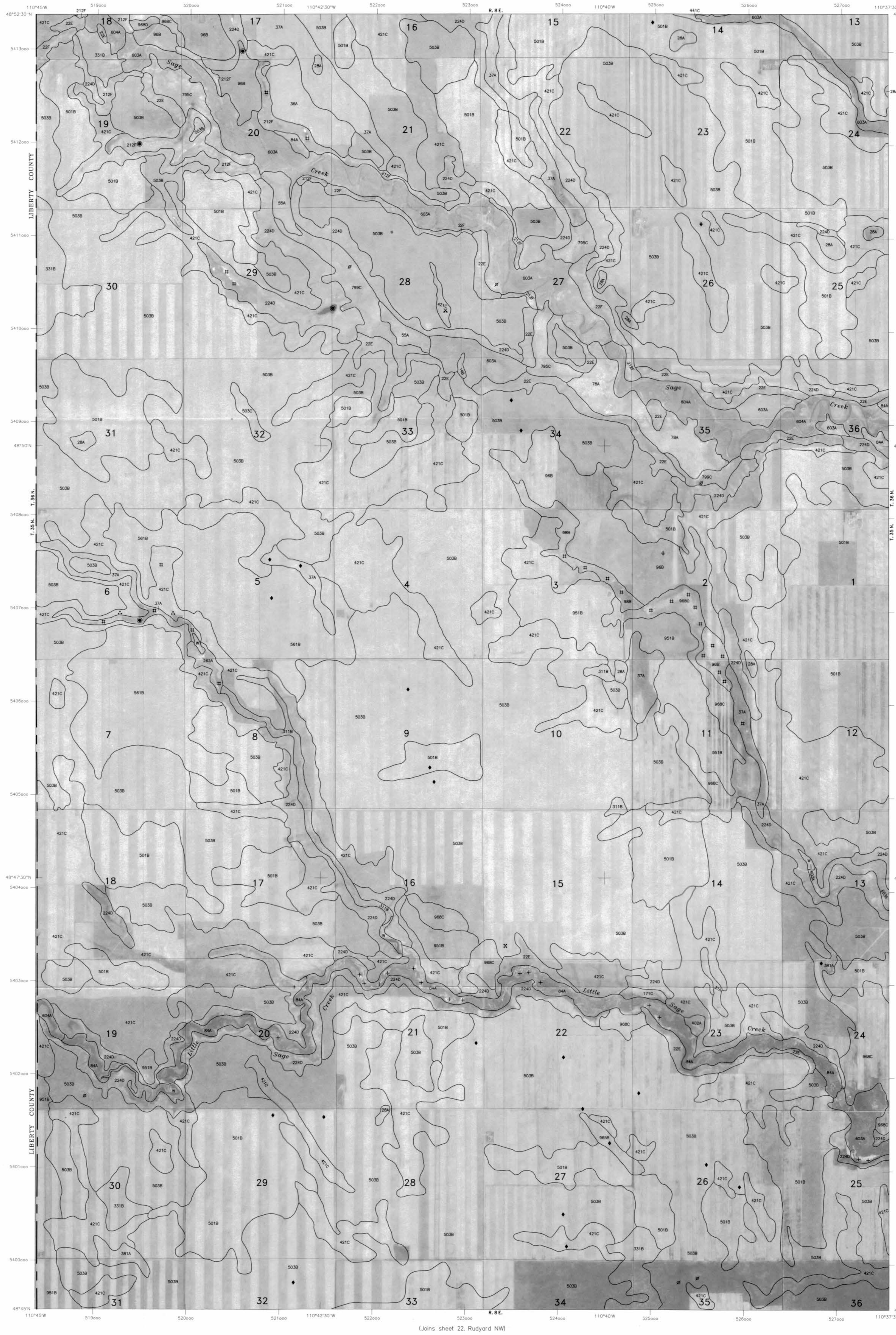
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 11 OF 71
HILL COUNTY, MONTANA
NORTH CHINOOK RESERVOIR NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
GOLDSTONE SW QUADRANGLE
SHEET NUMBER 12
7.5 MINUTE SERIES

(Joins sheet 1, Laird Lake)



(Joins sheet 22, Rudyard NW)

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

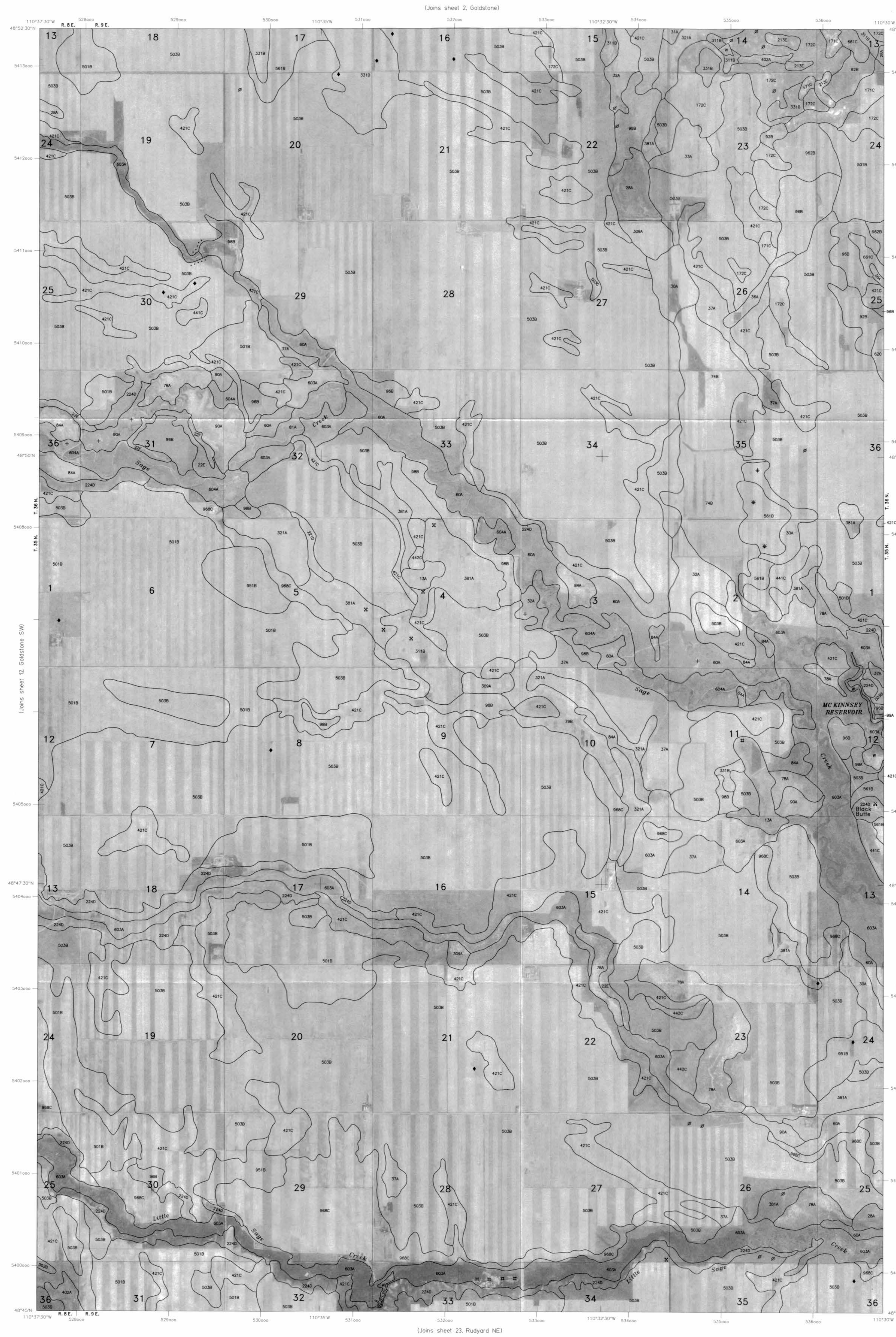
N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 12 OF 71
HILL COUNTY, MONTANA
GOLDSTONE SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE



1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

Scale 1:24000

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
McKINNSEY RESERVOIR EAST QUADRANGLE
SHEET NUMBER 14
7.5 MINUTE SERIES

(Joins sheet 3, Lost River)

(Joins sheet 24, Gildford NW)

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

SHEET NUMBER 14 OF 71
HILL COUNTY, MONTANA
McKINNSEY RESERVOIR EAST QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
NINEMILE COULEE WEST QUADRANGLE
SHEET NUMBER 15
7.5 MINUTE SERIES

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

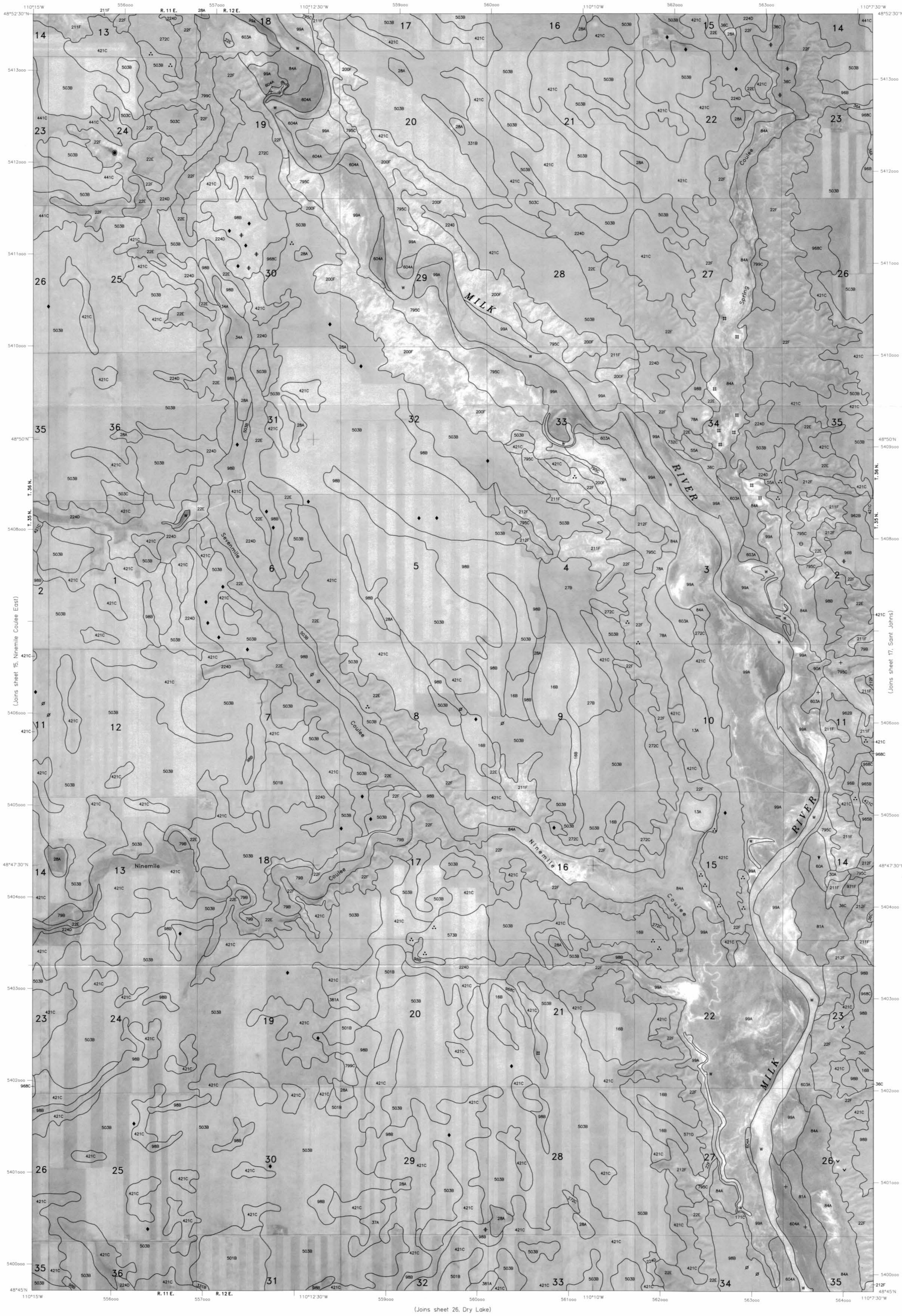
N

SHEET NUMBER 15 OF 71
HILL COUNTY, MONTANA
NINEMILE COULEE WEST QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
NINEMILE COULEE EAST QUADRANGLE
SHEET NUMBER 16
7.5 MINUTE SERIES

(Joins sheet 5, Simpson)



(Joins sheet 26, Dry Lake)

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 16 OF 71
HILL COUNTY, MONTANA
NINEMILE COULEE EAST QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
SAINT JOHNS QUADRANGLE
SHEET NUMBER 17
7.5 MINUTE SERIES

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

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SHEET NUMBER 17 OF 71
HILL COUNTY, MONTANA
SAINT JOHNS QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
COTTONWOOD QUADRANGLE
SHEET NUMBER 18
7.5 MINUTE SERIES

Scale 1:24000

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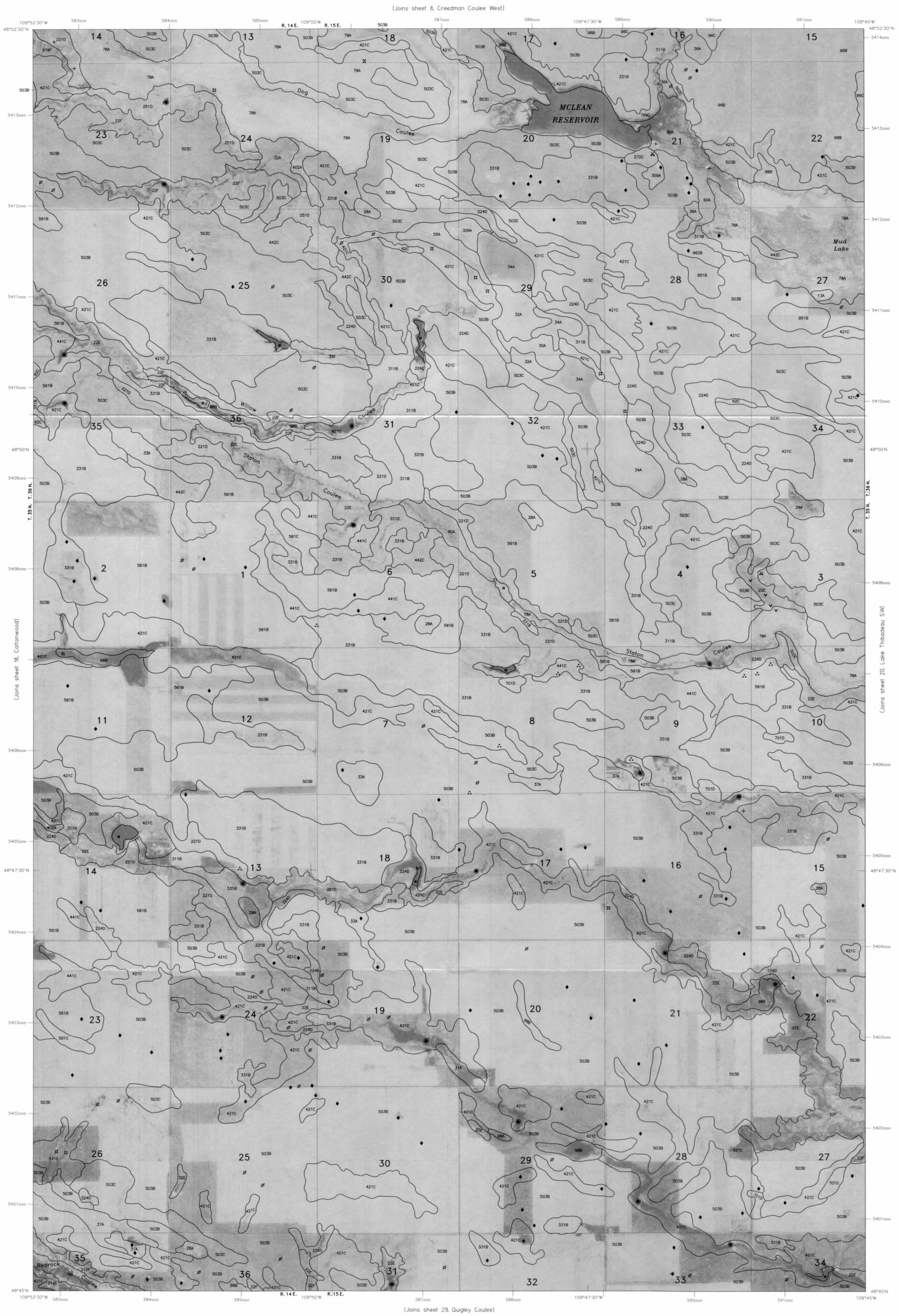
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 18 OF 71
HILL COUNTY, MONTANA
COTTONWOOD QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
HILLDALE COLONY QUADRANGLE
SHEET NUMBER 19
7.5 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 19 OF 71
HILL COUNTY, MONTANA
HILLDALE COLONY QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 9, Creedman Coulee East)

(Joins sheet 30, Havre NW)

Scale 1:24000

N

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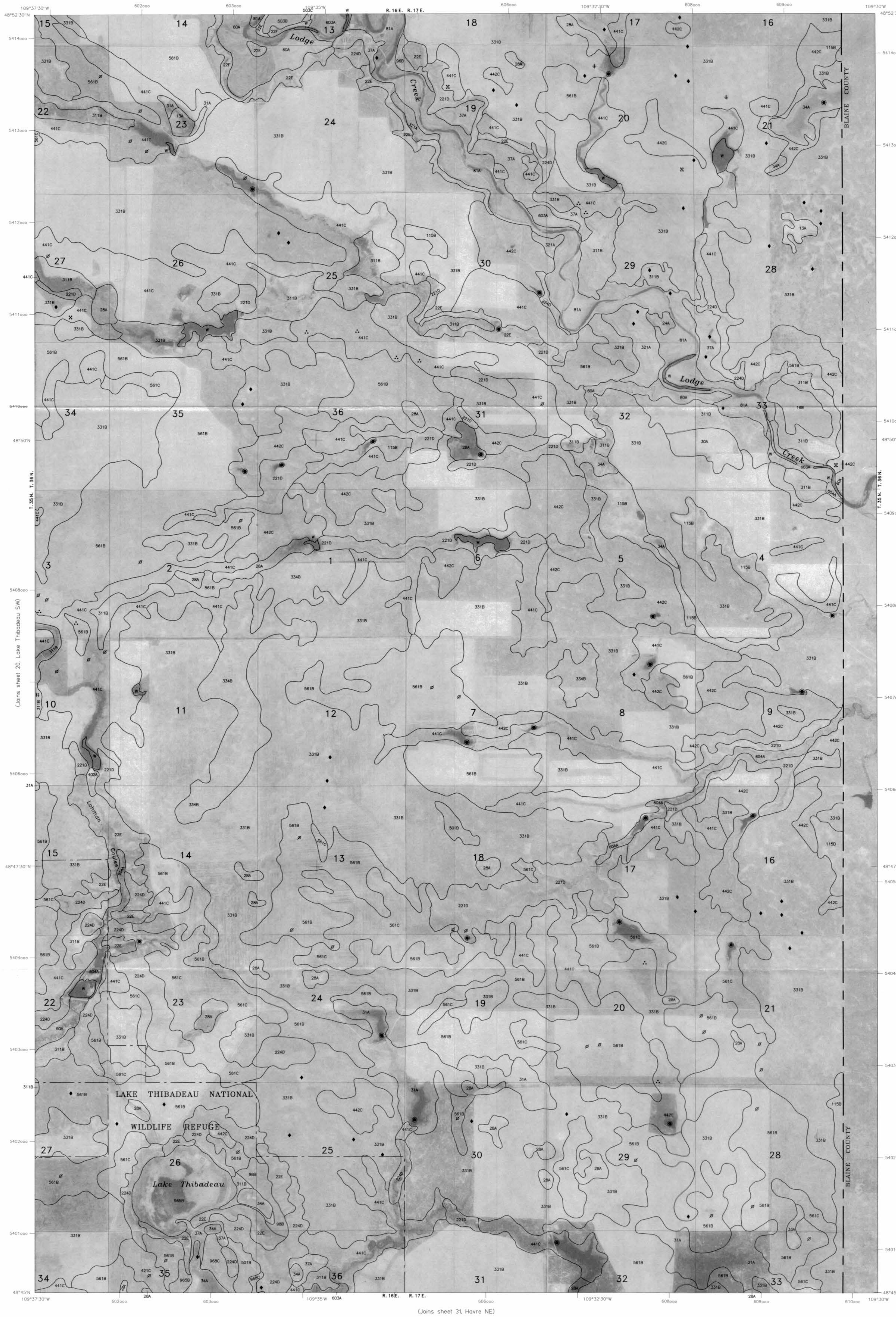
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 20 OF 71
HILL COUNTY, MONTANA
LAKE THIBADEAU SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 10, Lake Thibadeau NE)

(Joins sheet 20, Lake Thibadeau SW)



(Joins sheet 31, Havre NE)

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

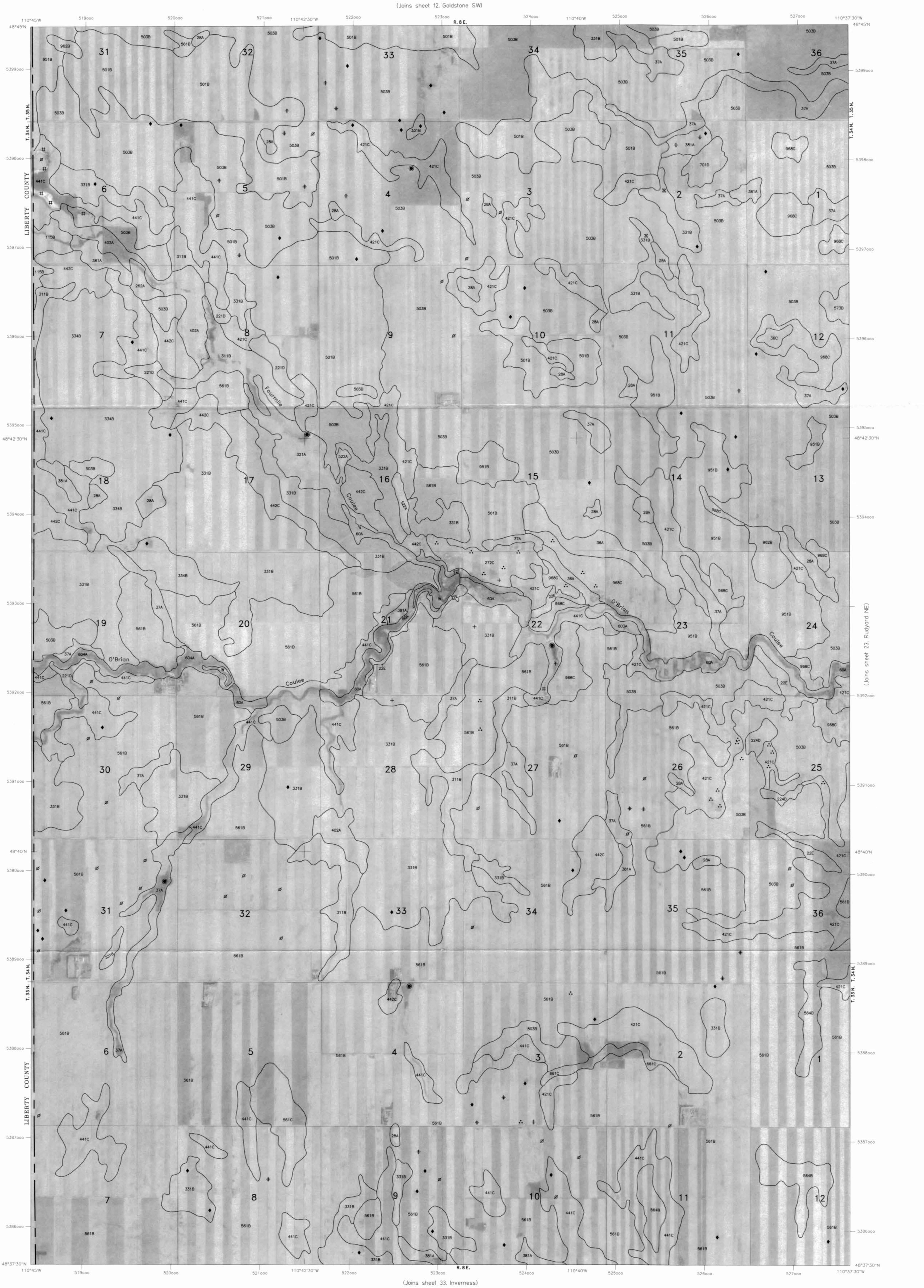
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 21 OF 71
HILL COUNTY, MONTANA
LAKE THIBADEAU QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA

RUDYARD NW QUADRANGLE
SHEET NUMBER 22
7.5 MINUTE SERIES



1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

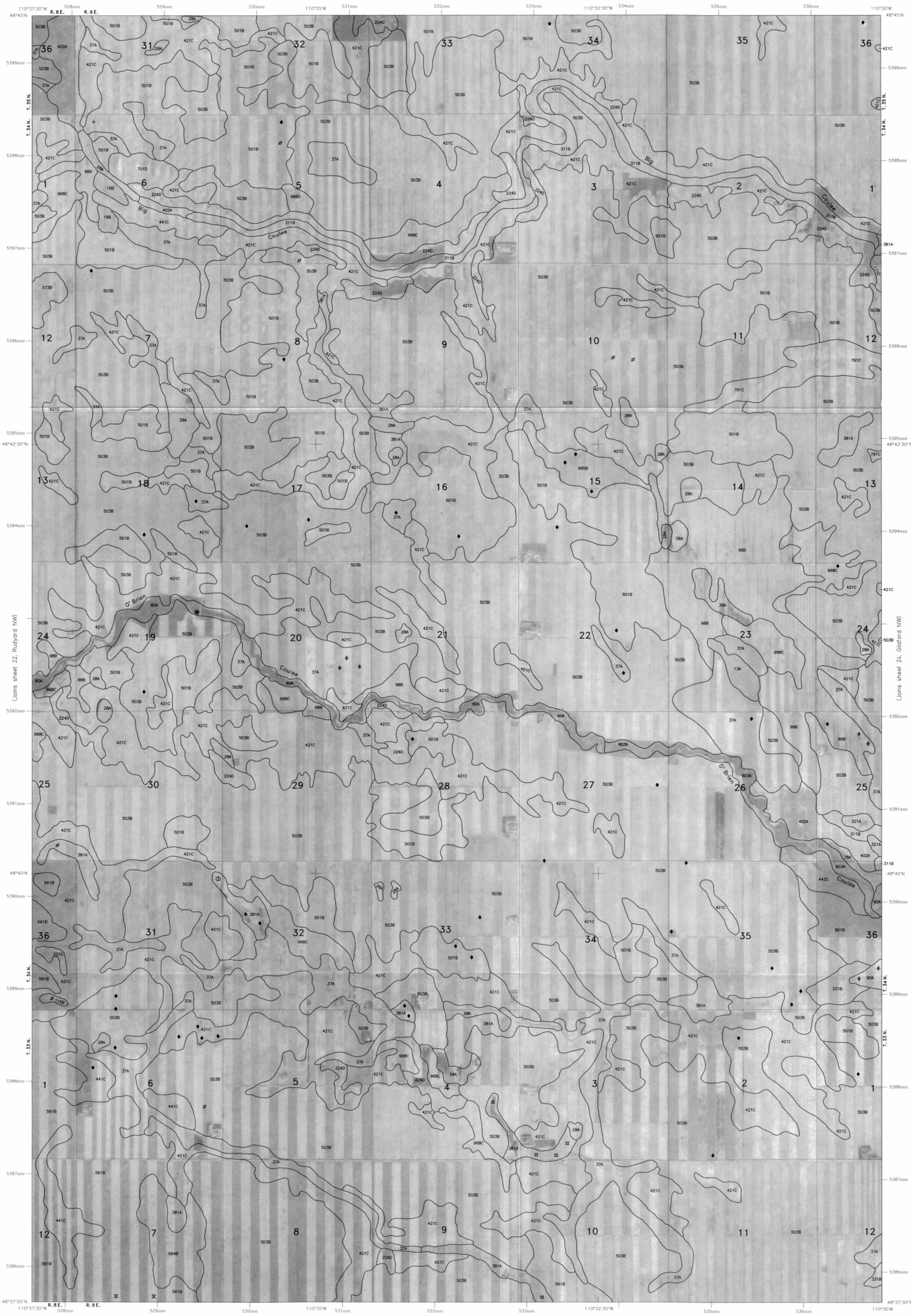
N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 22 OF 71
HILL COUNTY, MONTANA
RUDYARD NW QUADRANGLE

(Joins sheet 13, McKinnsey Reservoir West)



(Joins sheet 34, Rudyard)

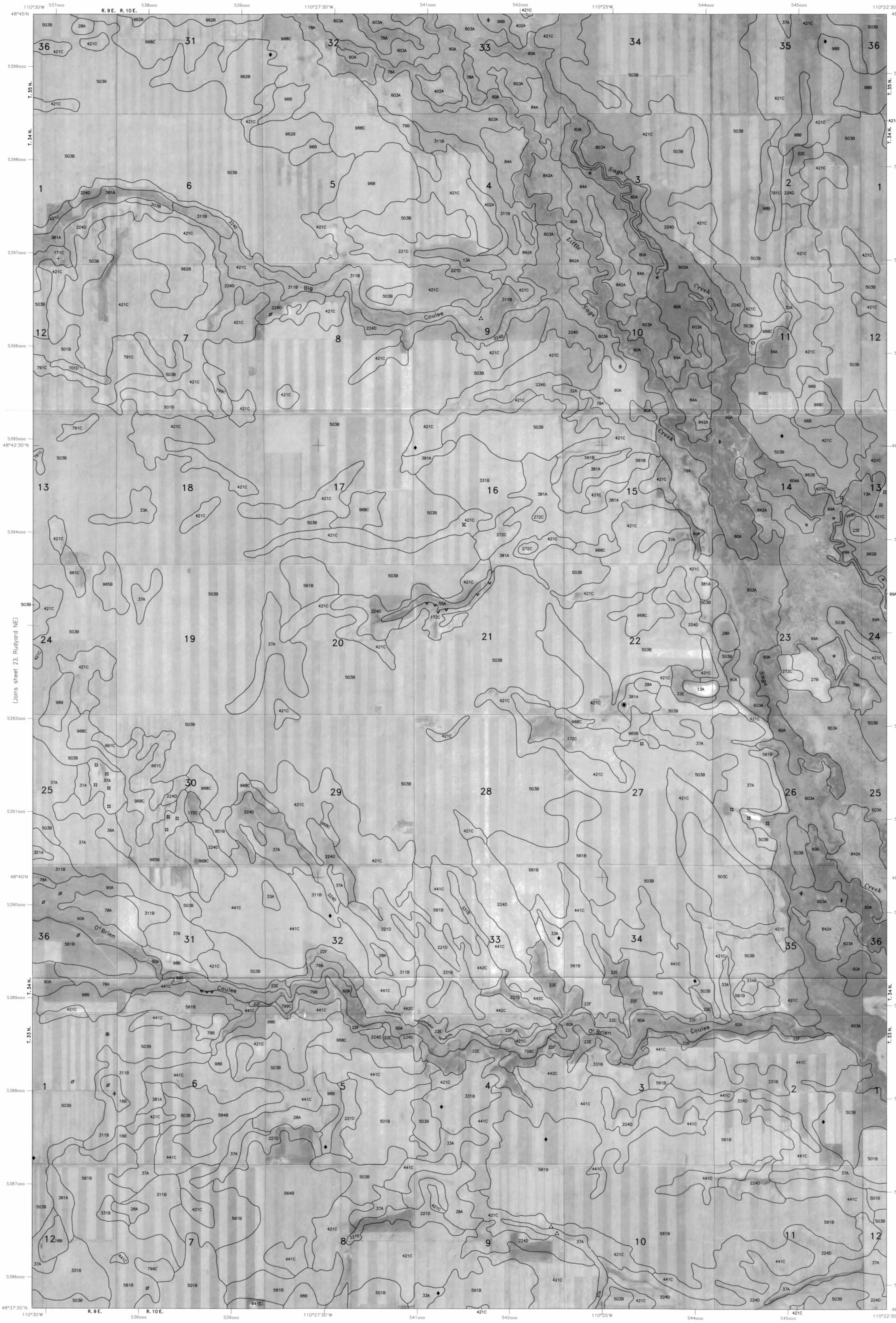
Scale 1:24000

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 23 OF 71
HILL COUNTY, MONTANA
RUDYARD NE QUADRANGLE

(Joins sheet 14, McKinnsey Reservoir East)



(Joins sheet 35, Hingham)

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

N

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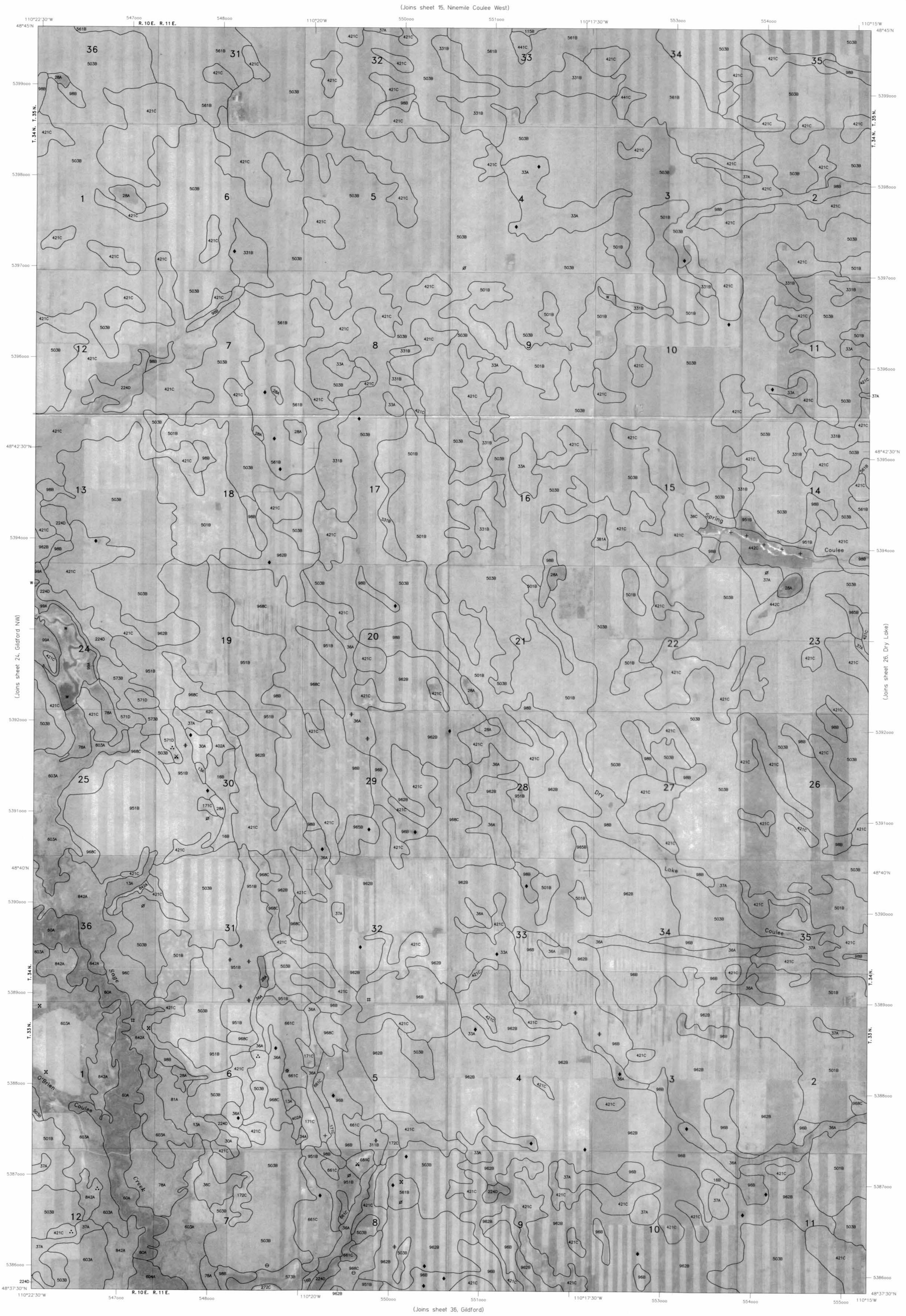
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 24 OF 71
HILL COUNTY, MONTANA
GILDFORD NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
GILDFORD NE QUADRANGLE
SHEET NUMBER 25
7.5 MINUTE SERIES



1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 25 OF 71
HILL COUNTY, MONTANA
GILDFORD NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
DRY LAKE QUADRANGLE
SHEET NUMBER 26
7.5 MINUTE SERIES

1 MILE 0 1
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

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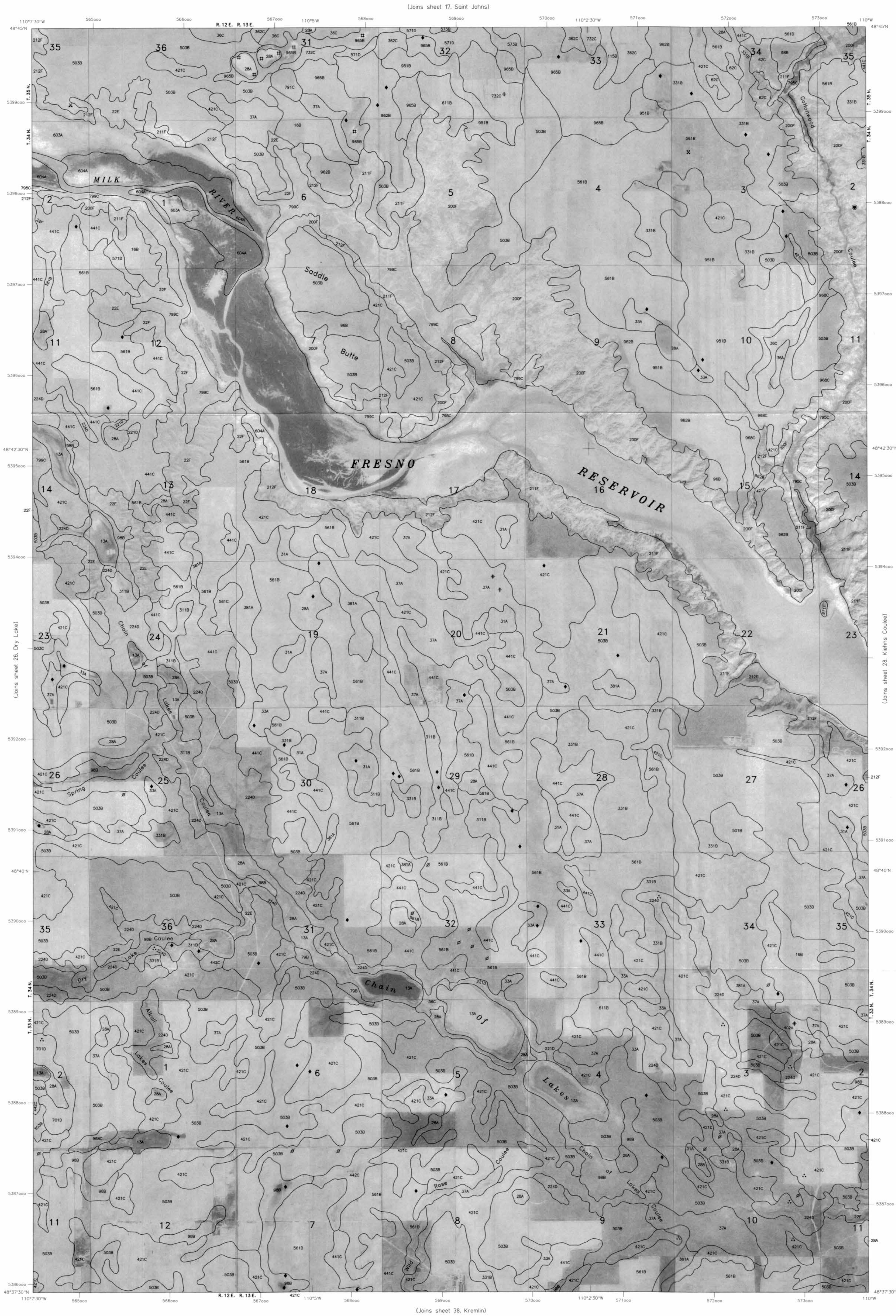
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 26 OF 71
HILL COUNTY, MONTANA
DRY LAKE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
SADDLE BUTTE QUADRANGLE
SHEET NUMBER 27
7.5 MINUTE SERIES



1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

N

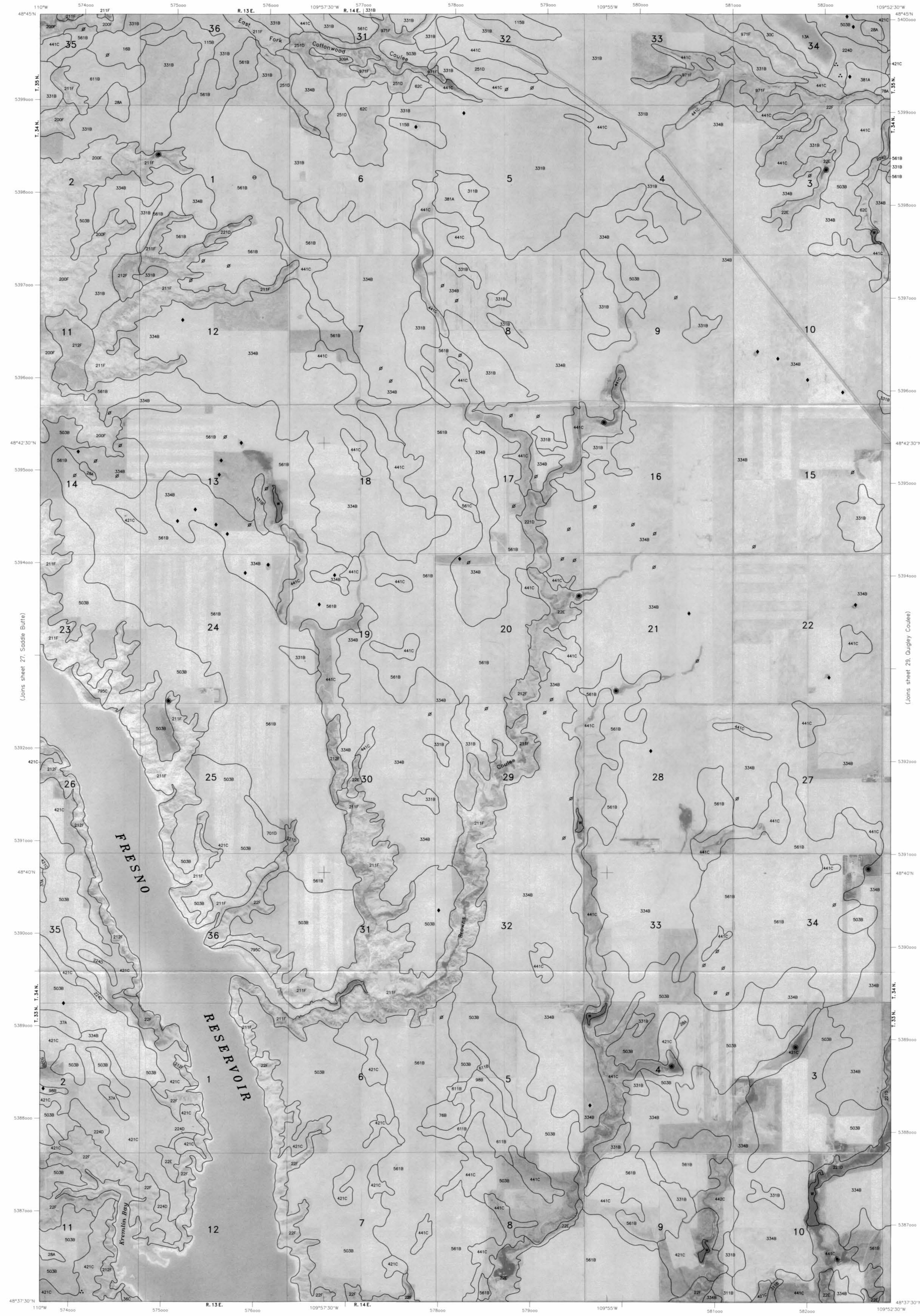
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 27 OF 71
HILL COUNTY, MONTANA
SADDLE BUTTE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 18, Cottonwood)



(Joins sheet 39, Fresno Dam)

1 MILE
1000 FEET
1 KILOMETER
Scale 1:24000

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

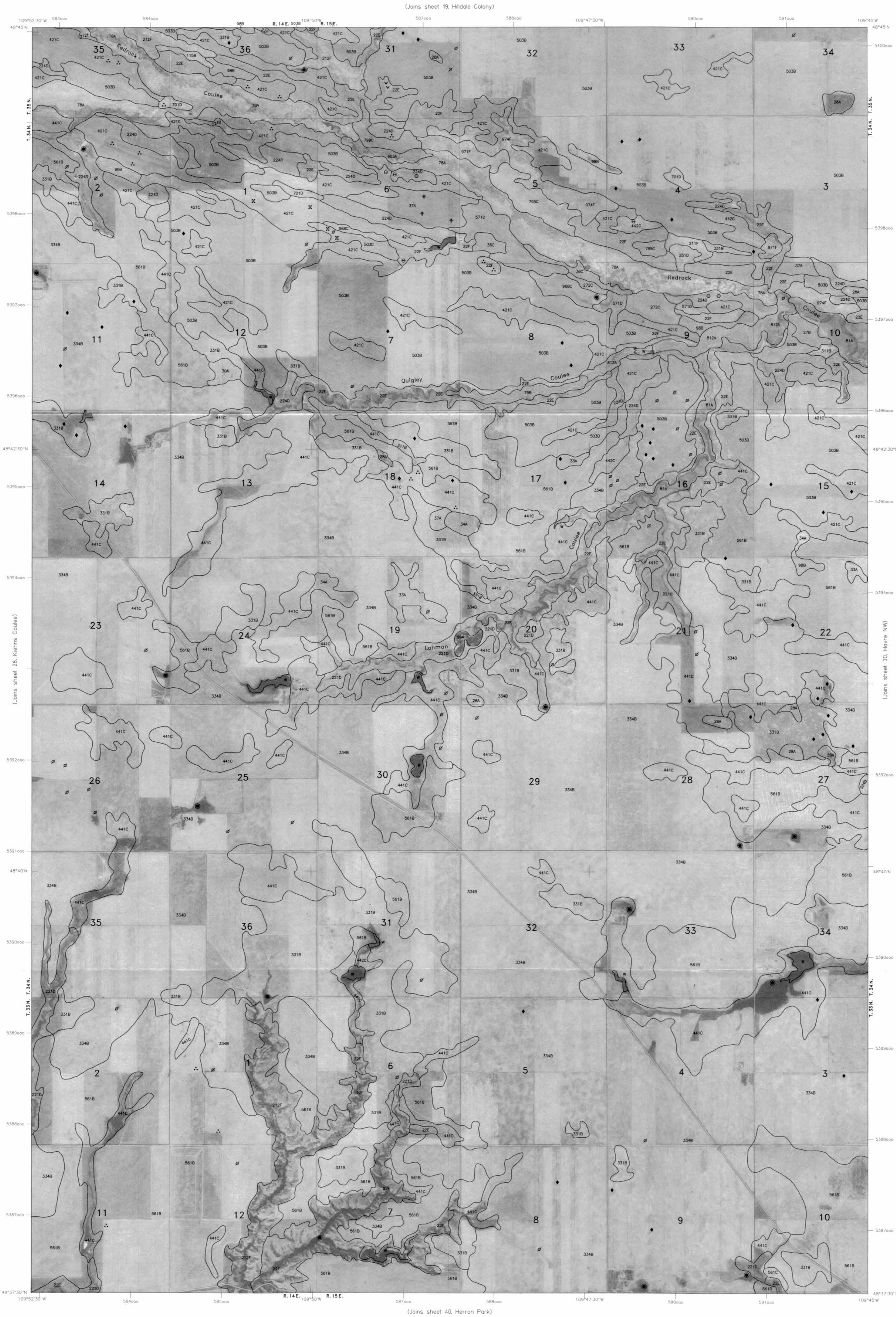
N

SHEET NUMBER 28 OF 71
HILL COUNTY, MONTANA
KIEHNS COULEE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA

QUIGLEY COULEE QUADRANGLE
SHEET NUMBER 29
7.5 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

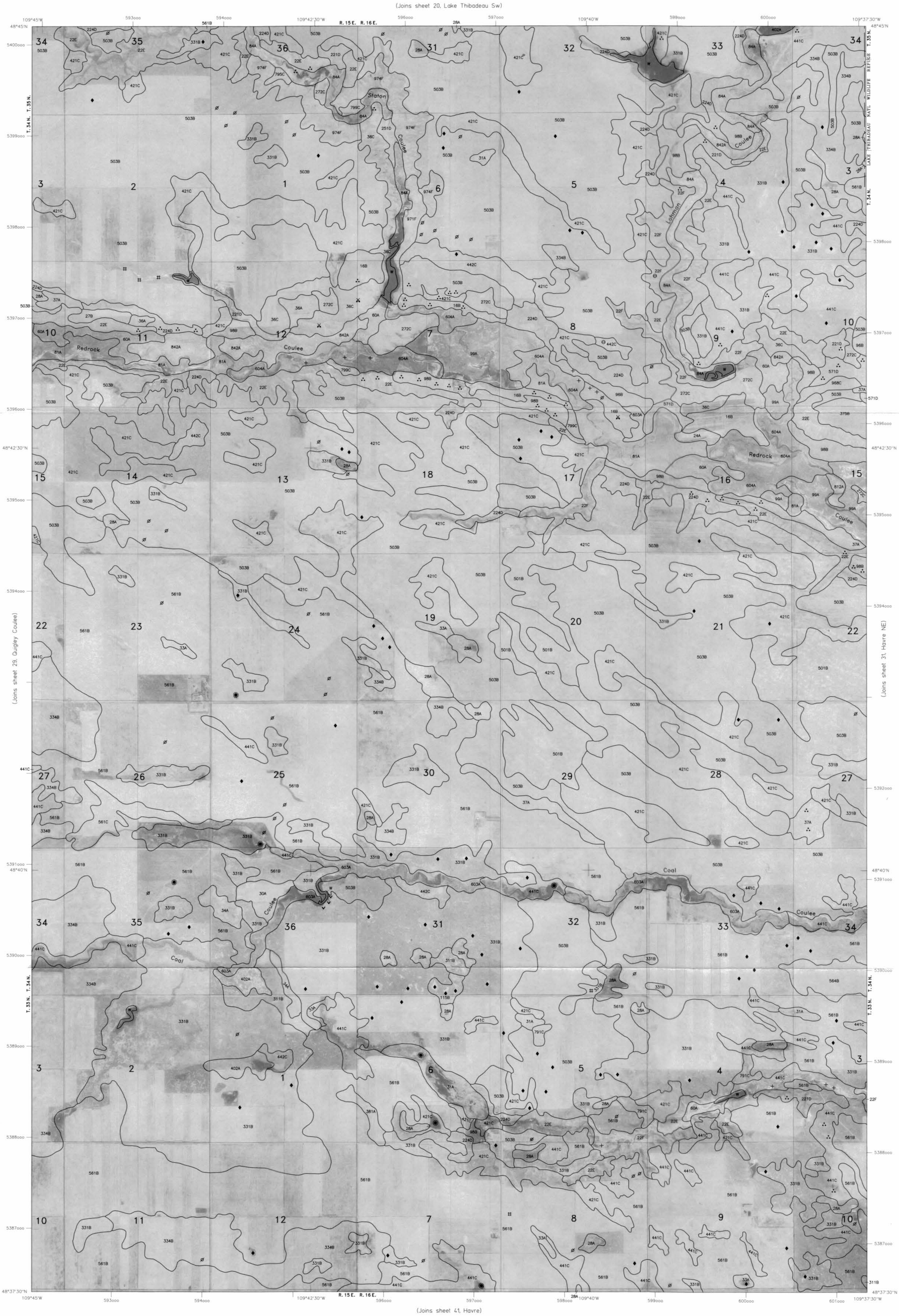
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 29 OF 71
HILL COUNTY, MONTANA
QUIGLEY COULEE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTNANA
HAVRE NW QUADRANGLE
SHEET NUMBER 30
7.5 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974—1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 30 OF 71
HILL COUNTY, MONTNANA
HAVRE NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
HAVRE NE QUADRANGLE
SHEET NUMBER 31
7.5 MINUTE SERIES

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 31 OF 71
HILL COUNTY, MONTANA
HAVRE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 44, Poverty Coulee NE)

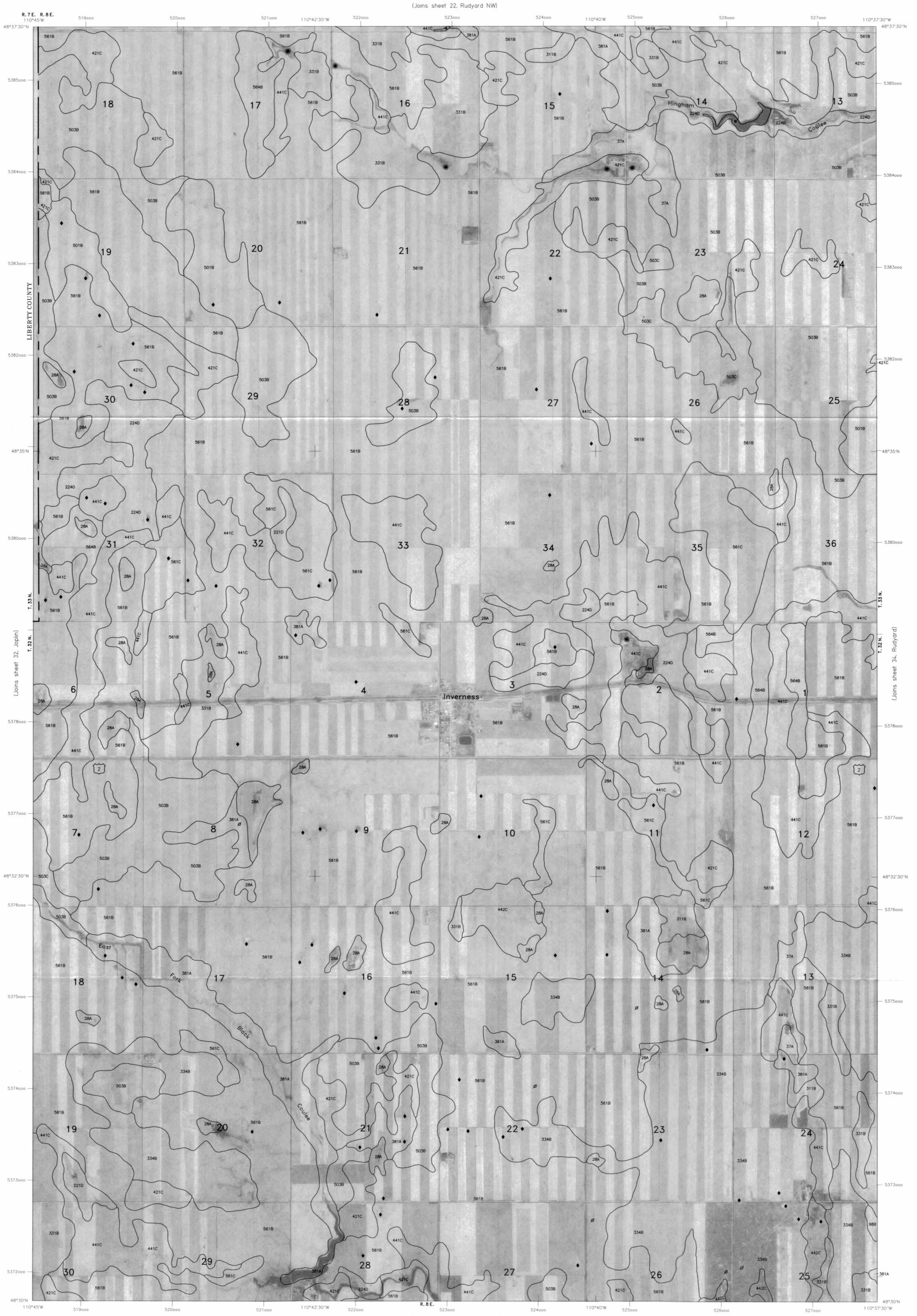
1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 32 OF 71
HILL COUNTY, MONTANA
JOPLIN QUADRANGLE



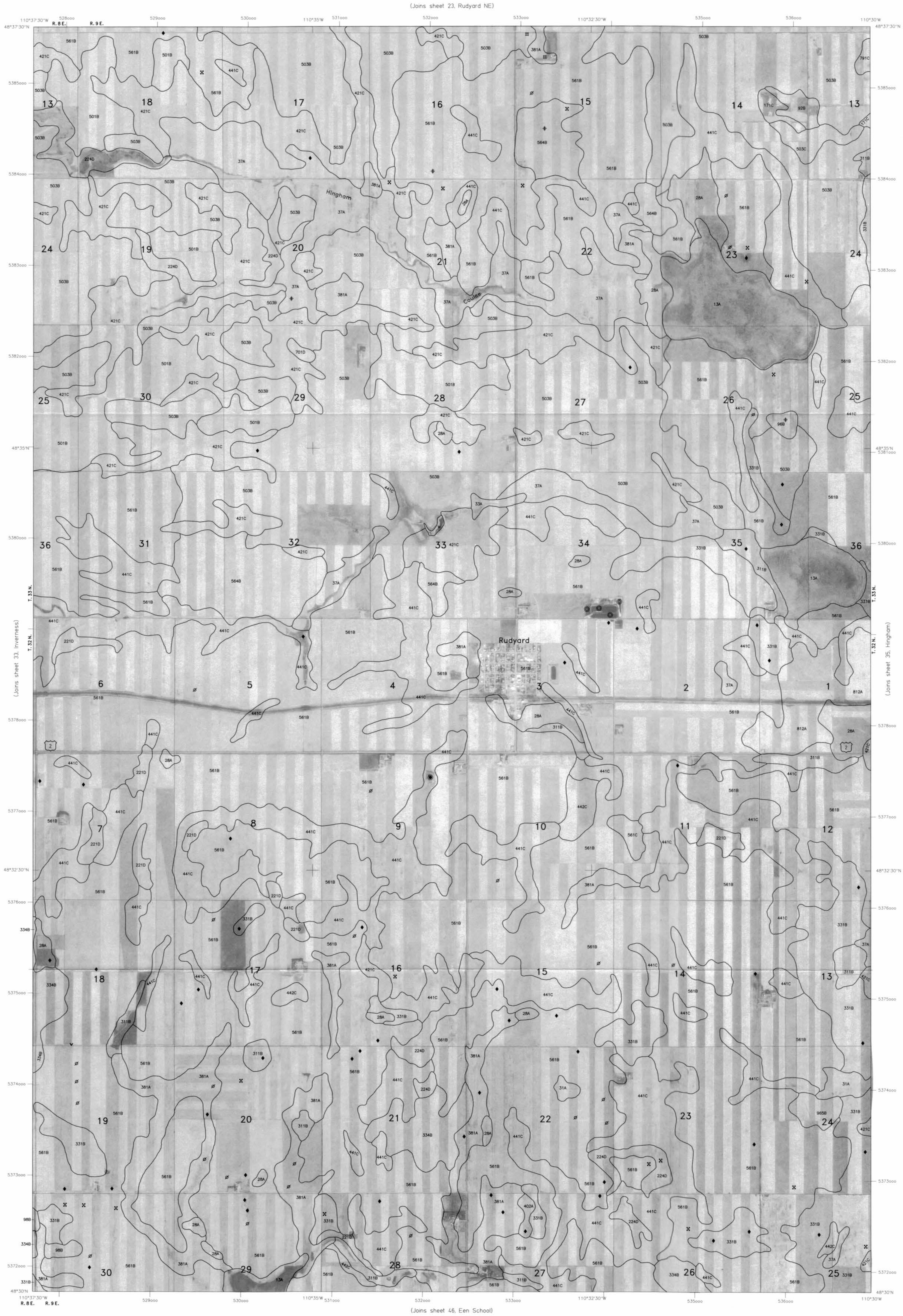
Scale 1:24000

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 33 OF 71
HILL COUNTY, MONTANA
INVERNESS QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

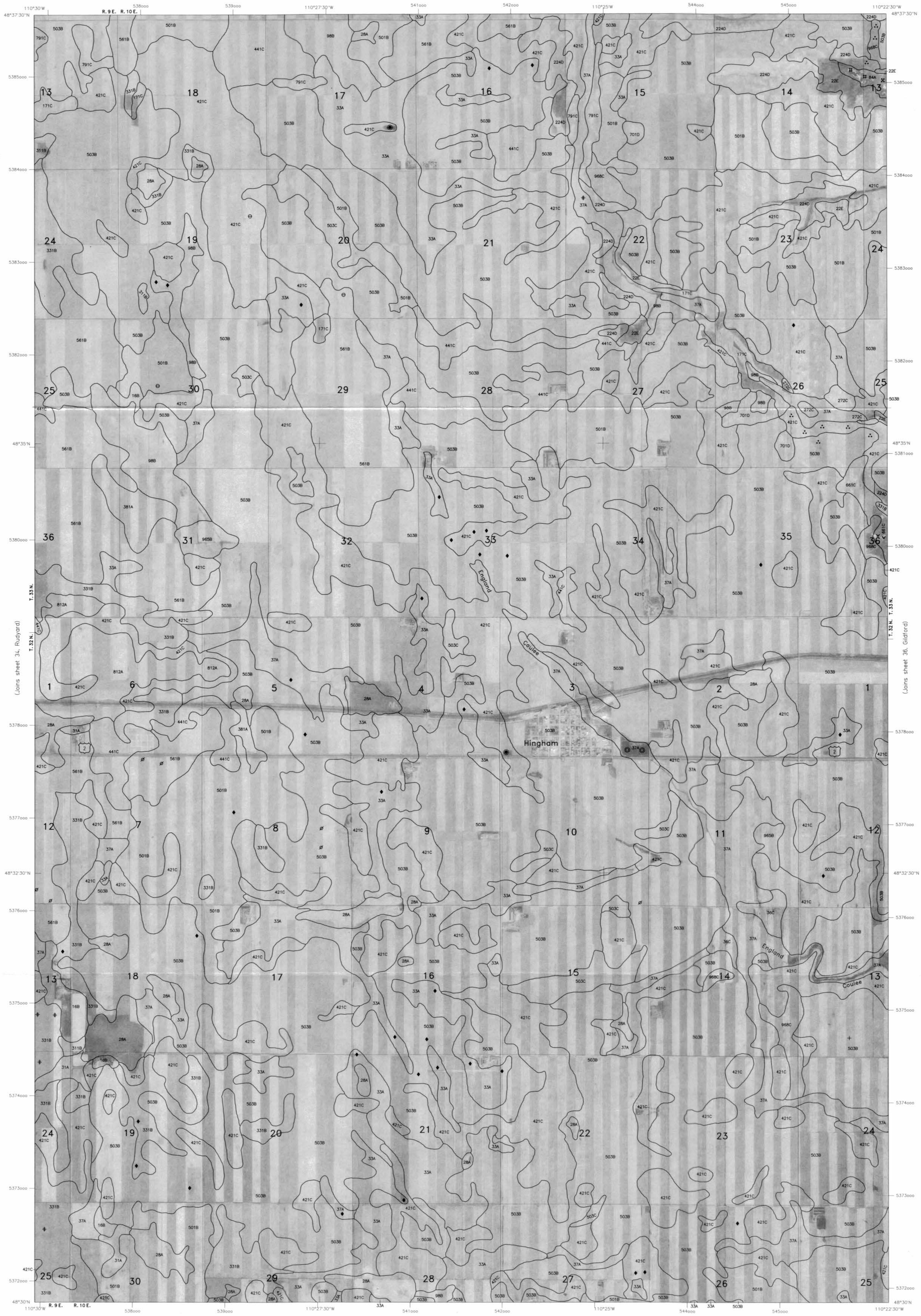
Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 34 OF 71
HILL COUNTY, MONTANA
RUDYARD QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 24, Gildford NW)



(Joins sheet 47, Fourteenmile Coulee NW)

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

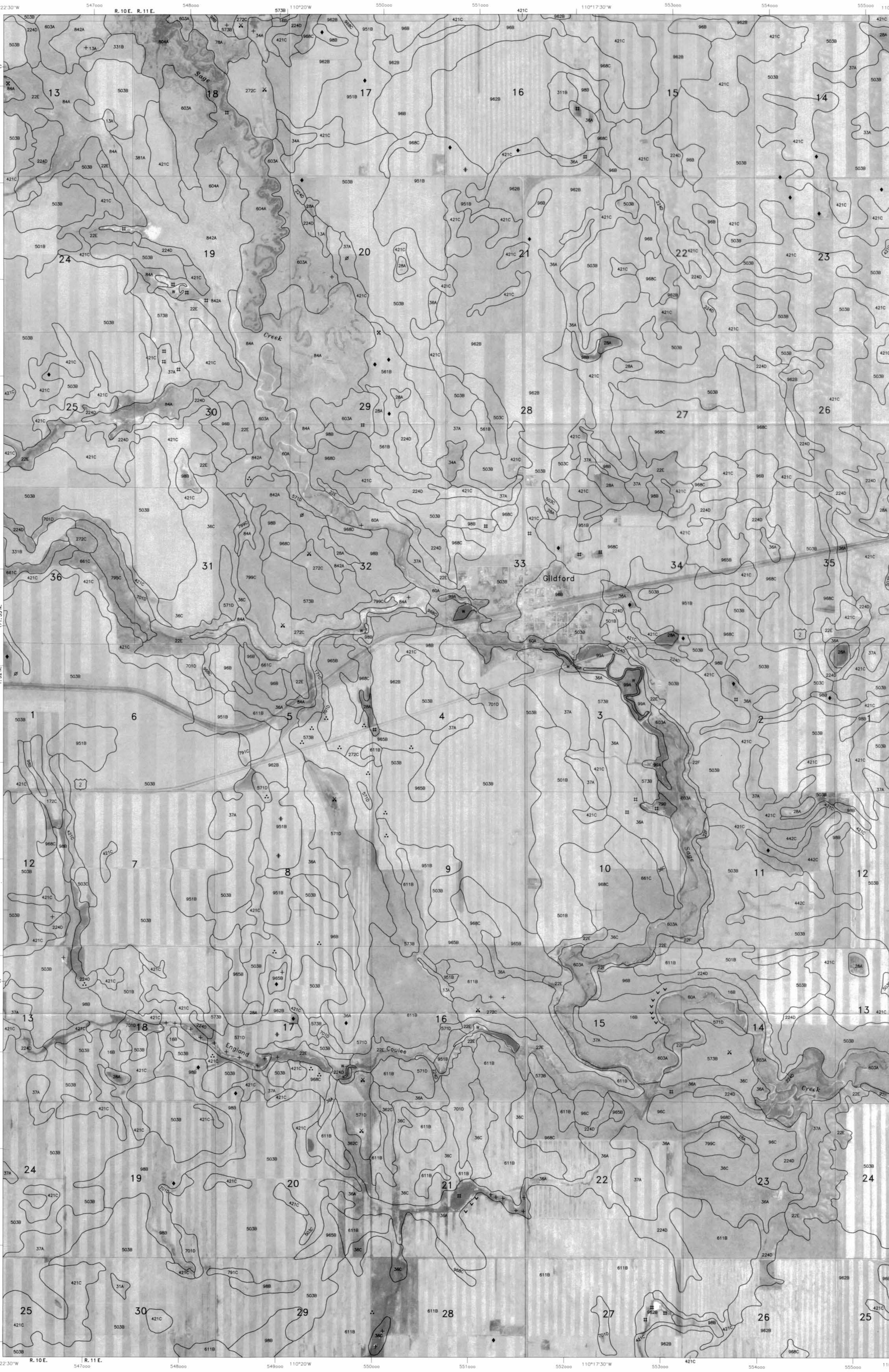
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

SHEET NUMBER 35 OF 71
HILL COUNTY, MONTANA
HINGHAM QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
GILDFORD QUADRANGLE
SHEET NUMBER 36
7.5 MINUTE SERIES

(Joins sheet 25, Gildford NE)



(Joins sheet 35, Hingham)

(Joins sheet 37, Sage Lake)

(Joins sheet 48, Fourteenmile Coulee NE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

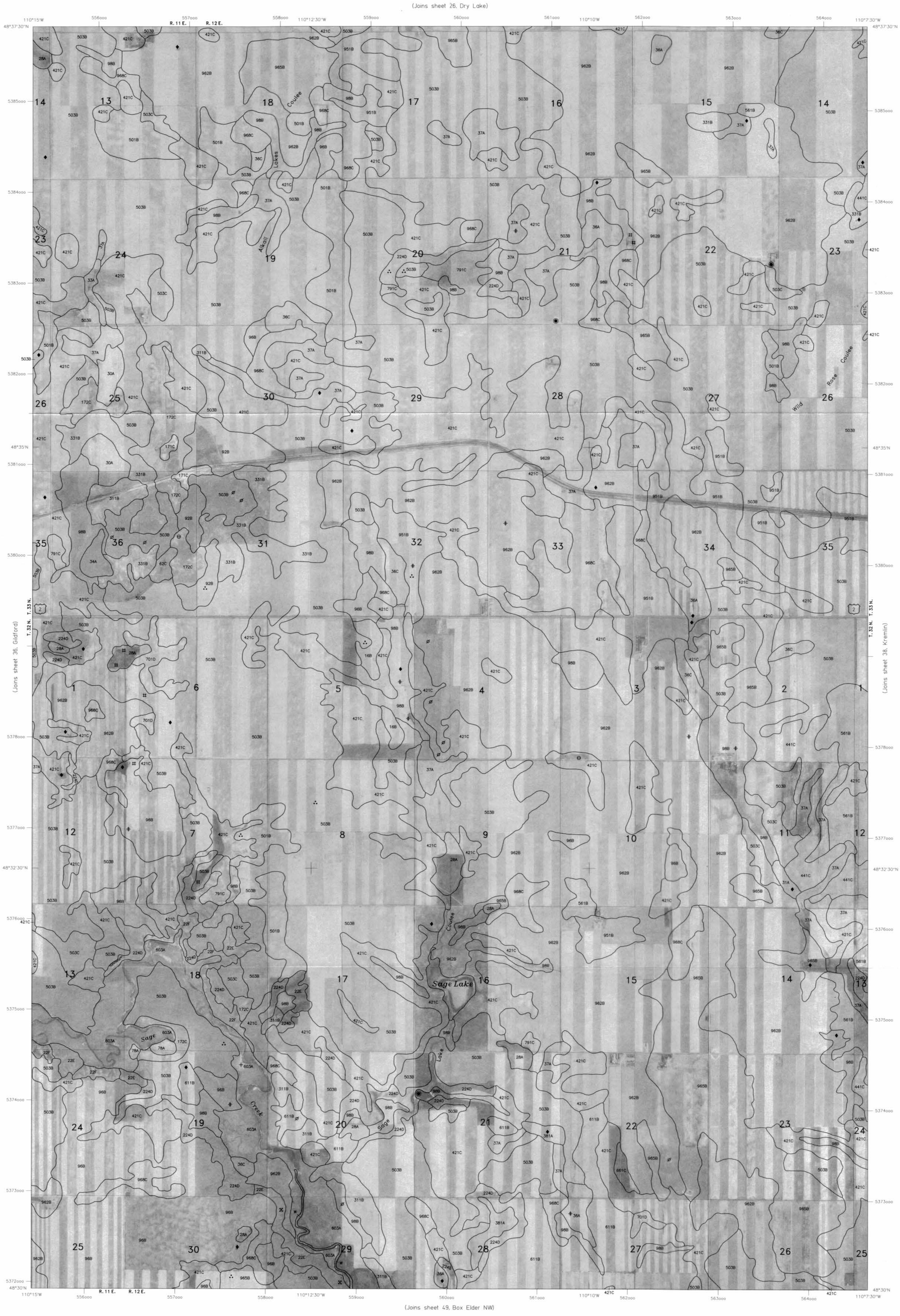
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 36 OF 71
HILL COUNTY, MONTANA
GILDFORD QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
SAGE LAKE QUADRANGLE
SHEET NUMBER 37
7.5 MINUTE SERIES



Scale 1:24000

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 37 OF 71
HILL COUNTY, MONTANA
SAGE LAKE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

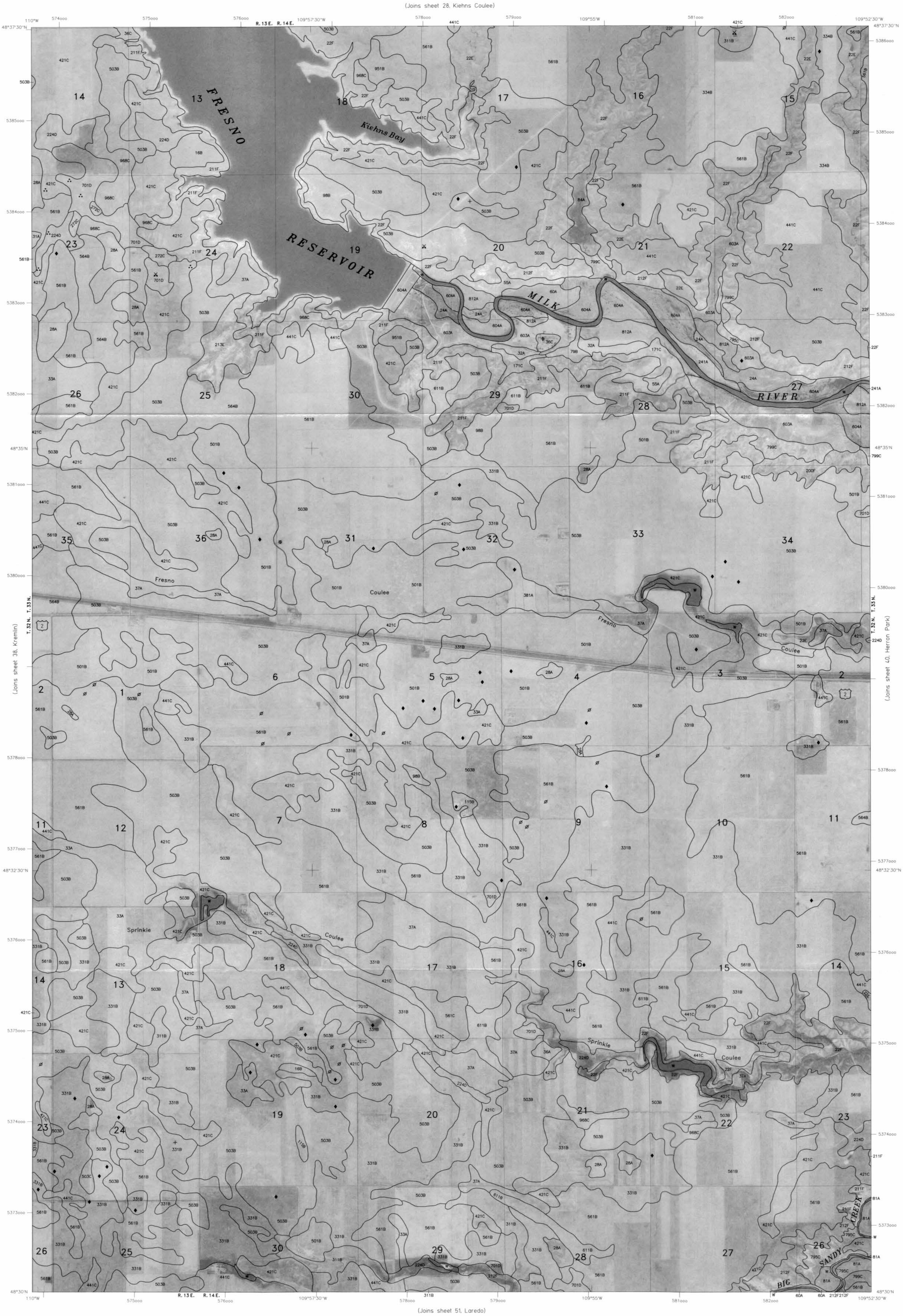
Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 38 OF 71
HILL COUNTY, MONTANA
KREMLIN QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE



1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

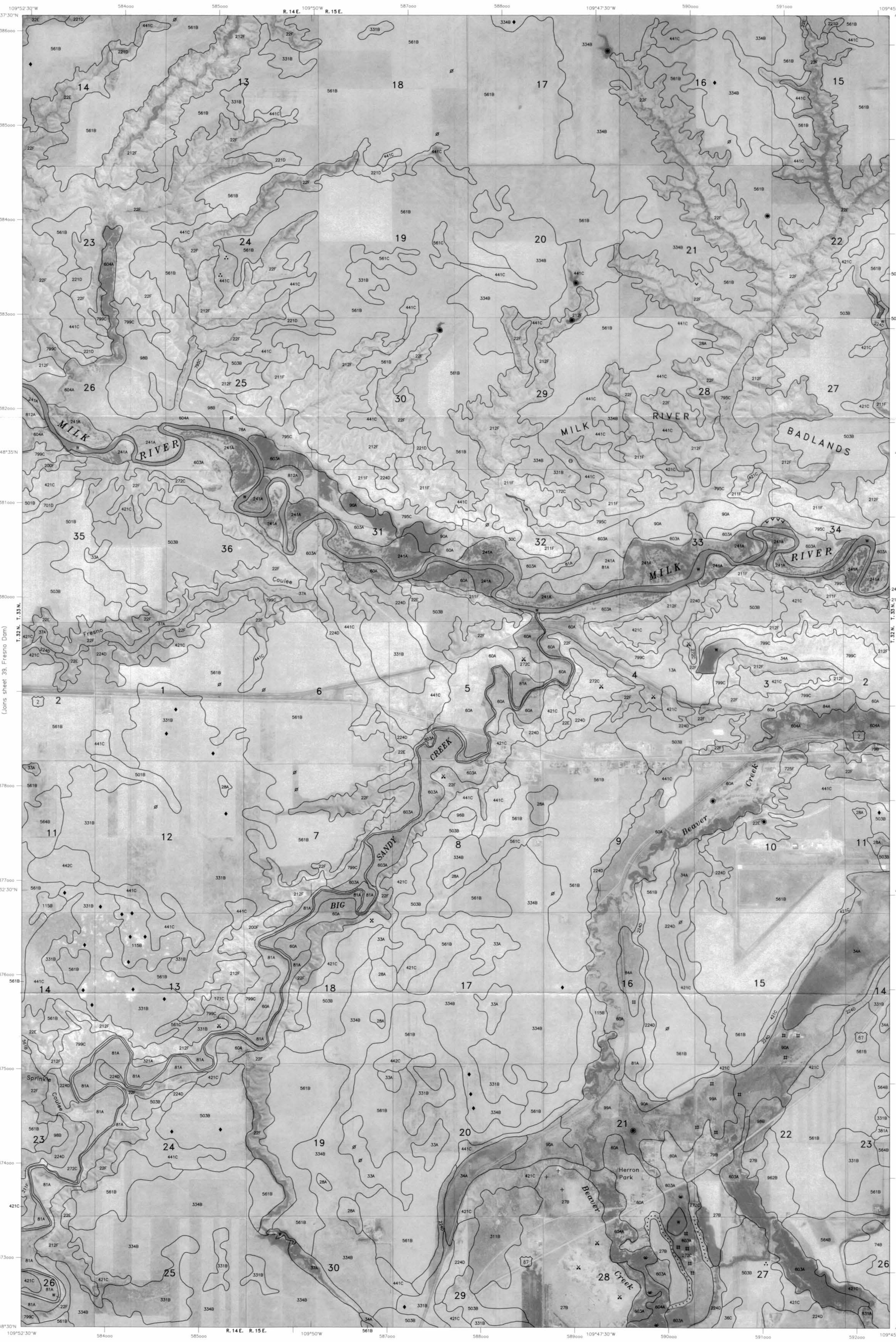
N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 39 OF 71
HILL COUNTY, MONTANA
FRESNO DAM QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:24000

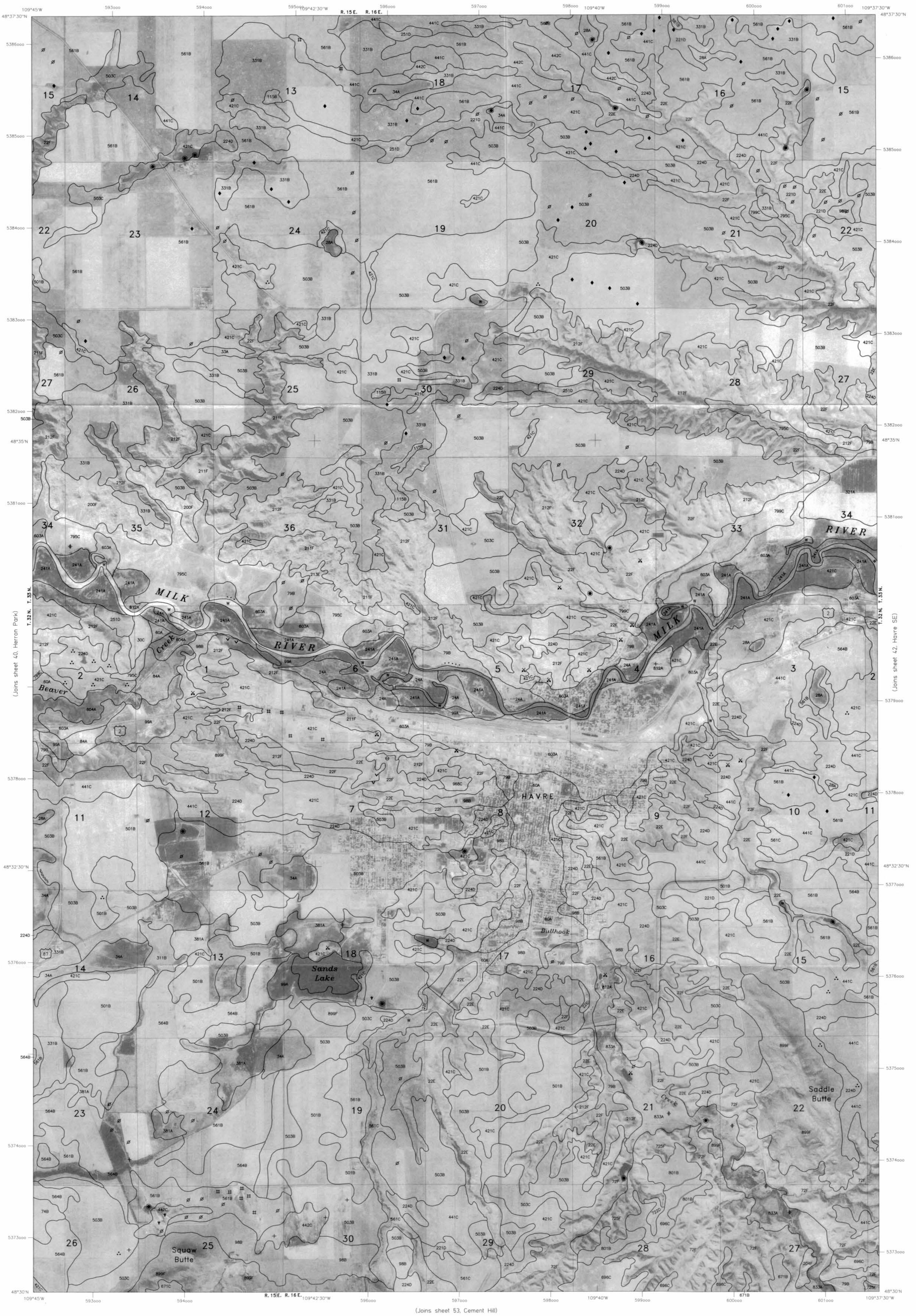
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 40 OF 71
HILL COUNTY, MONTANA
HERRON PARK QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 30, Havre NW)



(Joins sheet 53, Cement Hill)

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

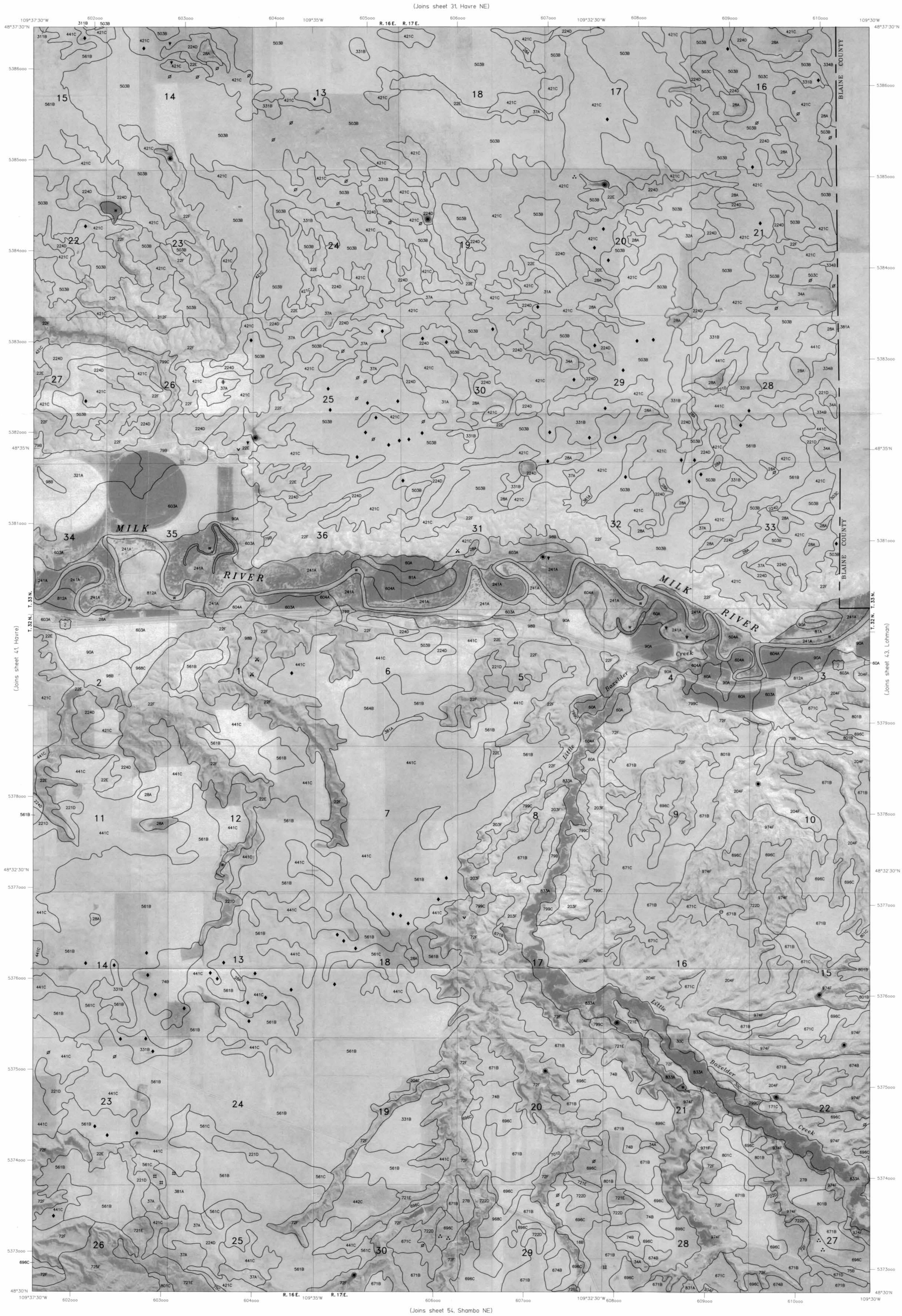
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 41 OF 71
HILL COUNTY, MONTANA
HAVRE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA

HAVRE SE QUADRANGLE
SHEET NUMBER 42
7.5 MINUTE SERIES



1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 42 OF 71
HILL COUNTY, MONTANA
HAVRE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 55, Lloyd NW)

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 43 OF 71
HILL COUNTY, MONTANA
LOHMAN QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
POVERTY COULEE NE QUADRANGLE
SHEET NUMBER 44
7.5 MINUTE SERIES

(Joins sheet 32, Joplin)

(Joins sheet 56, Poverty Coulee SE)

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 44 OF 71
HILL COUNTY, MONTANA
POVERTY COULEE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
N

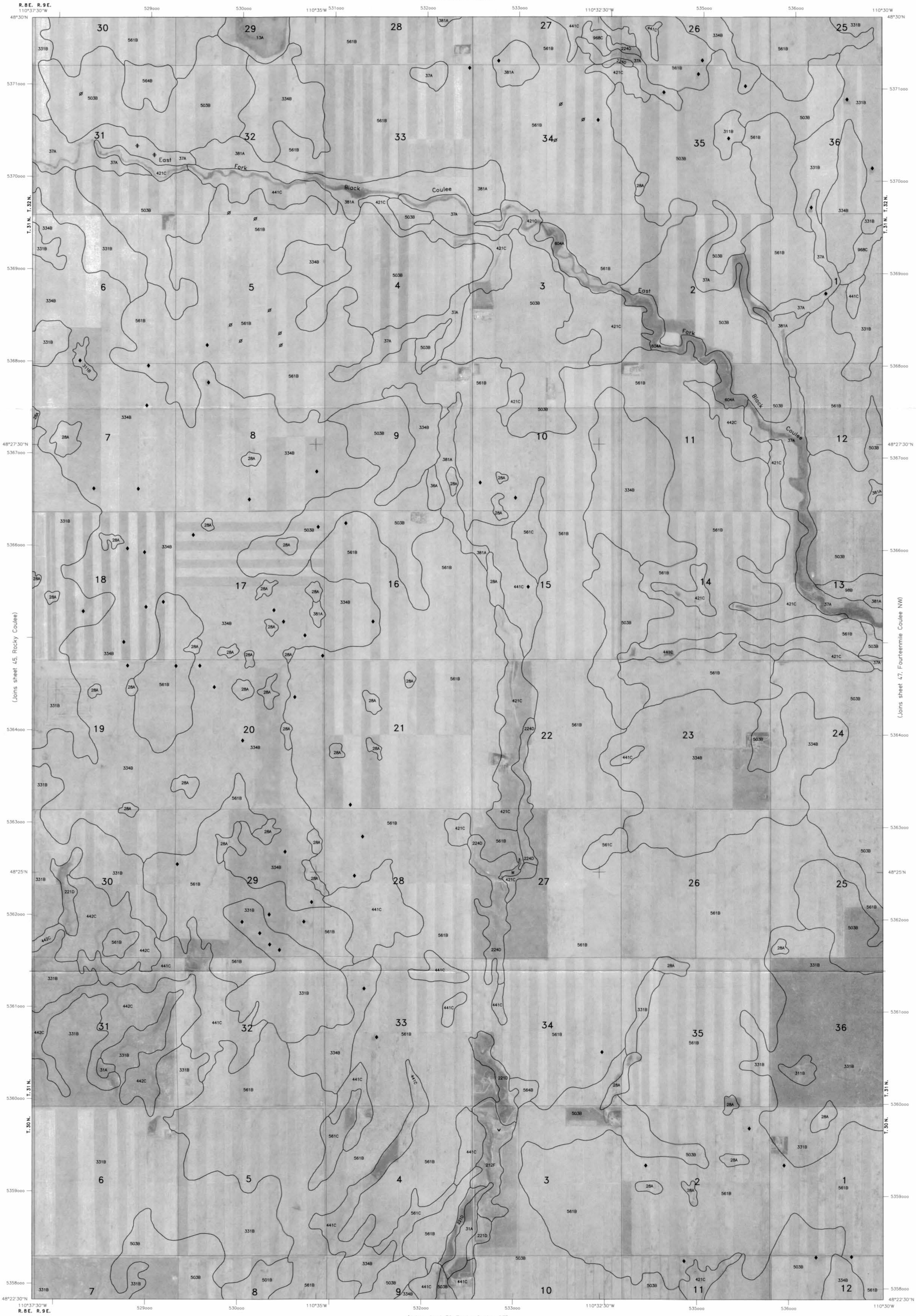
Scale 1:24000

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
EEN SCHOOL QUADRANGLE
SHEET NUMBER 46
7.5 MINUTE SERIES



1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

N

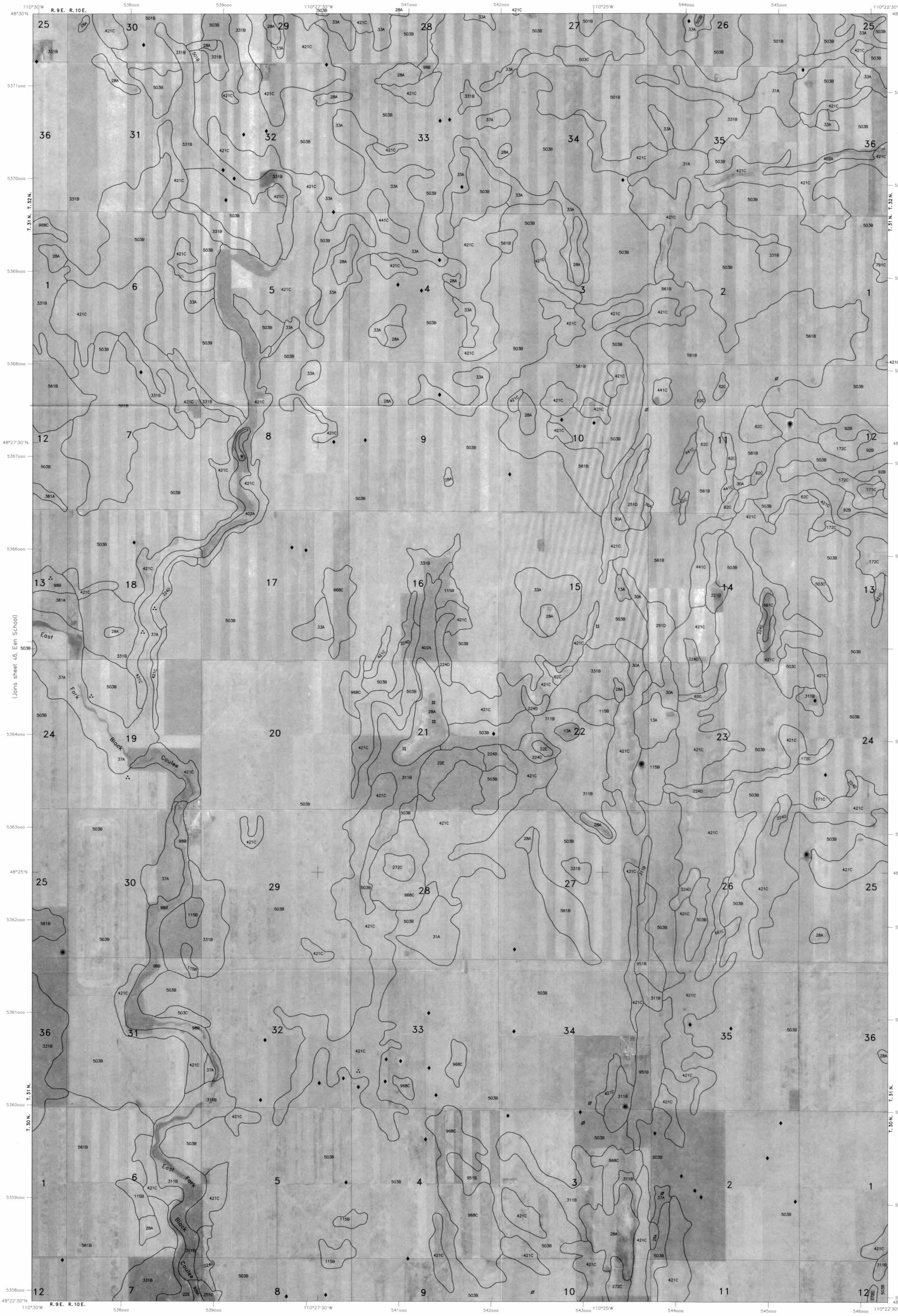
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 46 OF 71
HILL COUNTY, MONTANA
EEN SCHOOL QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 35, Hingham)



(Joins sheet 46, Eden School)

(Joins sheet 48, Fourteenmile Coulee NE)

(Joins sheet 59, Fourteenmile Coulee SW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 47 OF 71
HILL COUNTY, MONTANA
FOURTEENMILE COULEE NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA

FOURTEENMILE COULEE NE QUADRANGLE
SHEET NUMBER 48
7.5 MINUTE SERIES

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

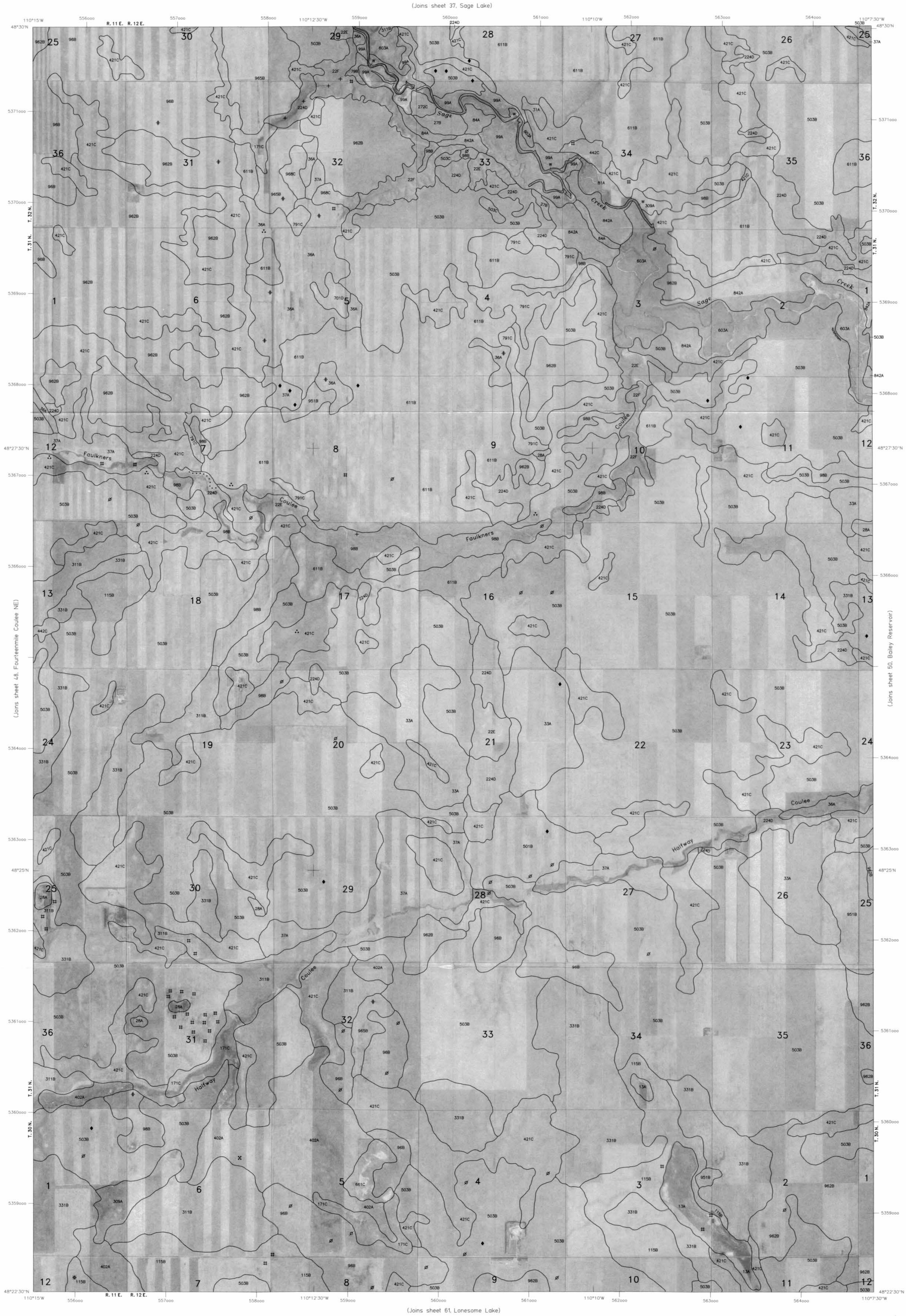
N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974—1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 48 OF 71
HILL COUNTY, MONTANA
FOURTEENMILE COULEE NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE



1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

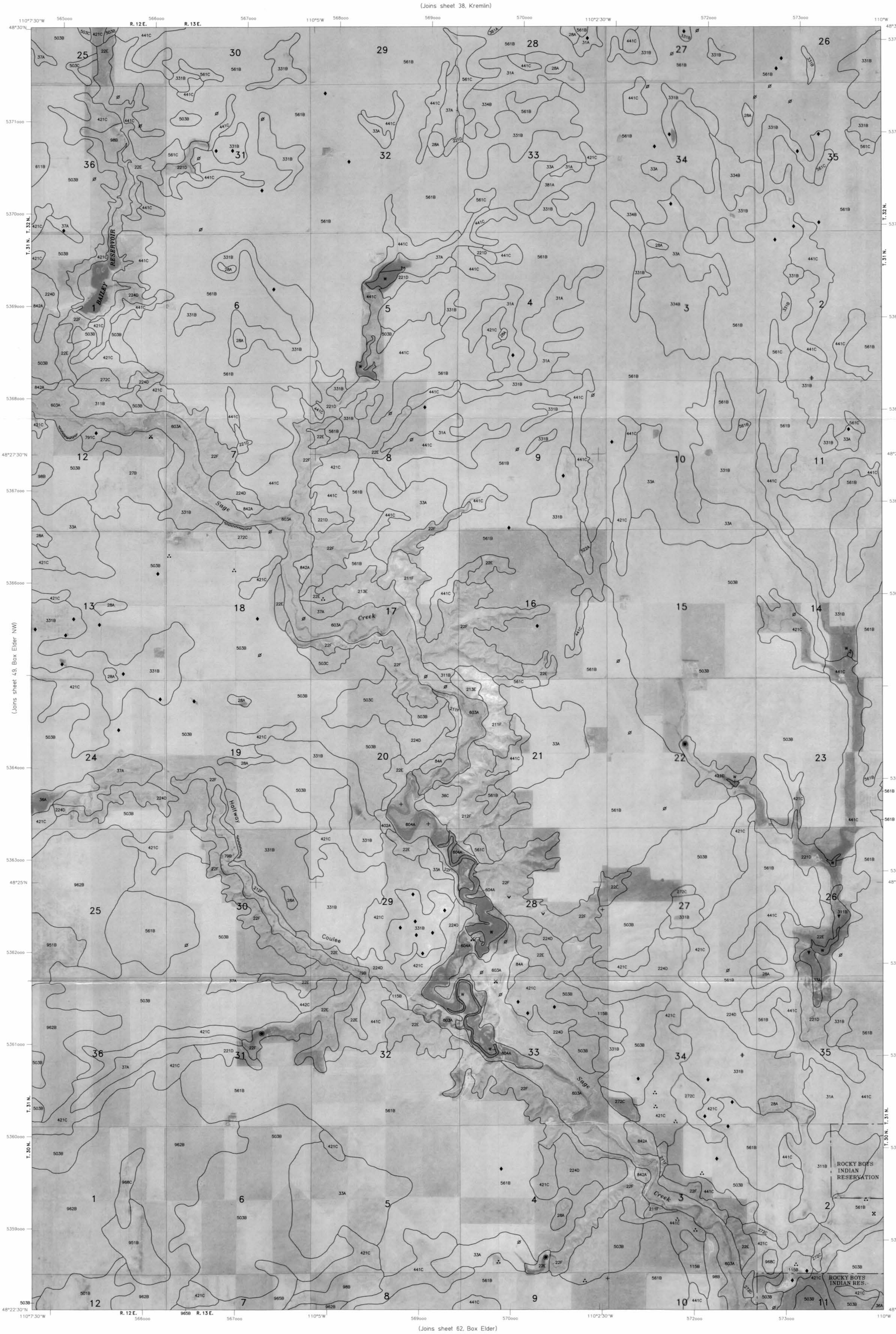
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 49 OF 71
HILL COUNTY, MONTANA
BOX ELDER NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
BAILEY RESERVOIR QUADRANGLE
SHEET NUMBER 50
7.5 MINUTE SERIES



1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974—1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 50 OF 71
HILL COUNTY, MONTANA
BAILEY RESERVOIR QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
LAREDO QUADRANGLE
SHEET NUMBER 51
7.5 MINUTE SERIES

Scale 1:24000

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 51 OF 71
HILL COUNTY, MONTANA
LAREDO QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
LAREDO NE QUADRANGLE
SHEET NUMBER 52
7.5 MINUTE SERIES

Scale 1:24000

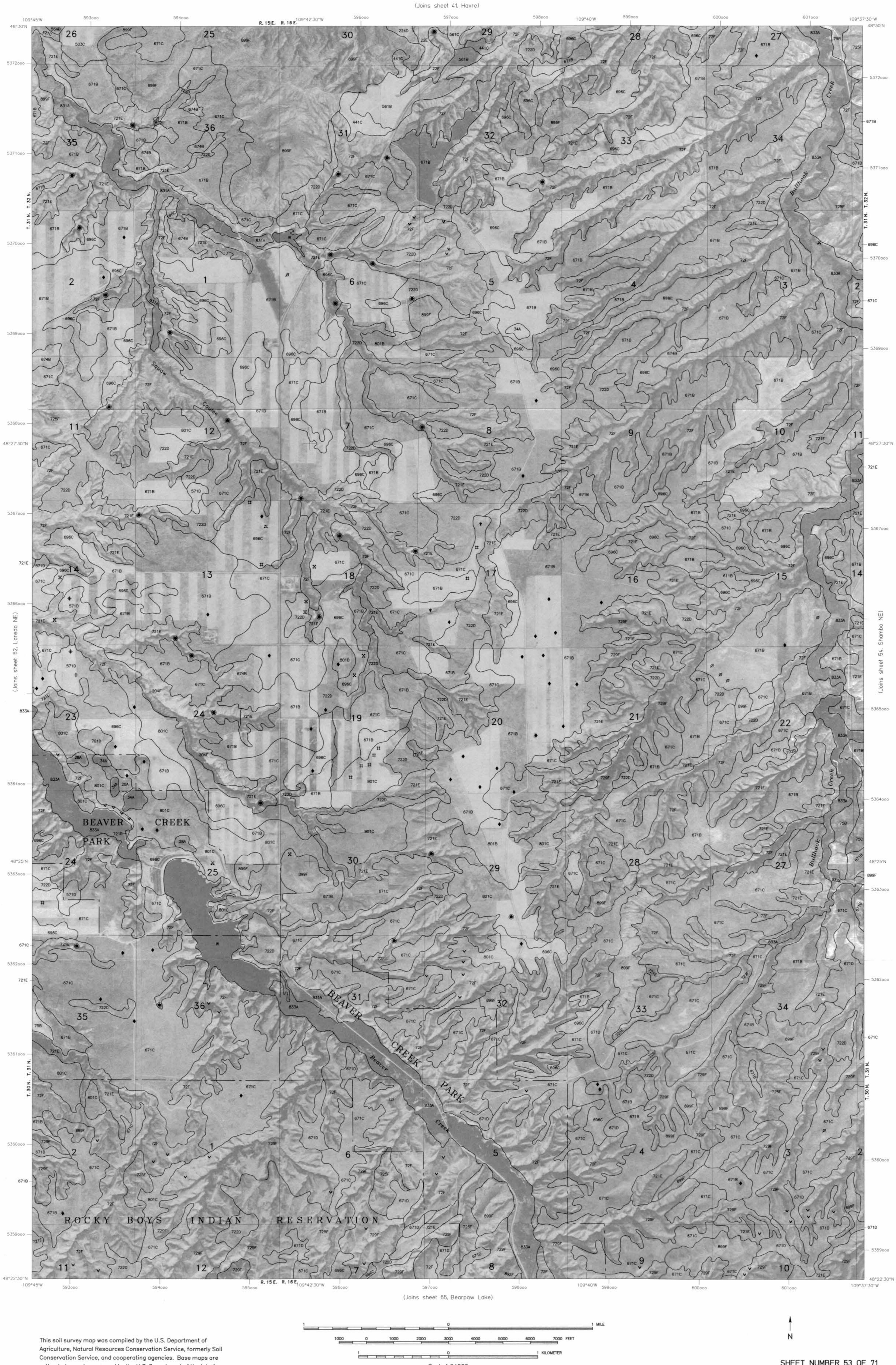
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 52 OF 71
HILL COUNTY, MONTANA
LAREDO NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
CEMENT HILL QUADRANGLE
SHEET NUMBER 53
7.5 MINUTE SERIES



Scale 1:24000

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 53 OF 71
HILL COUNTY, MONTANA
CEMENT HILL QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 54 OF 71
HILL COUNTY, MONTANA
SHAMBO NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
LLOYD NW QUADRANGLE
SHEET NUMBER 55
7.5 MINUTE SERIES

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

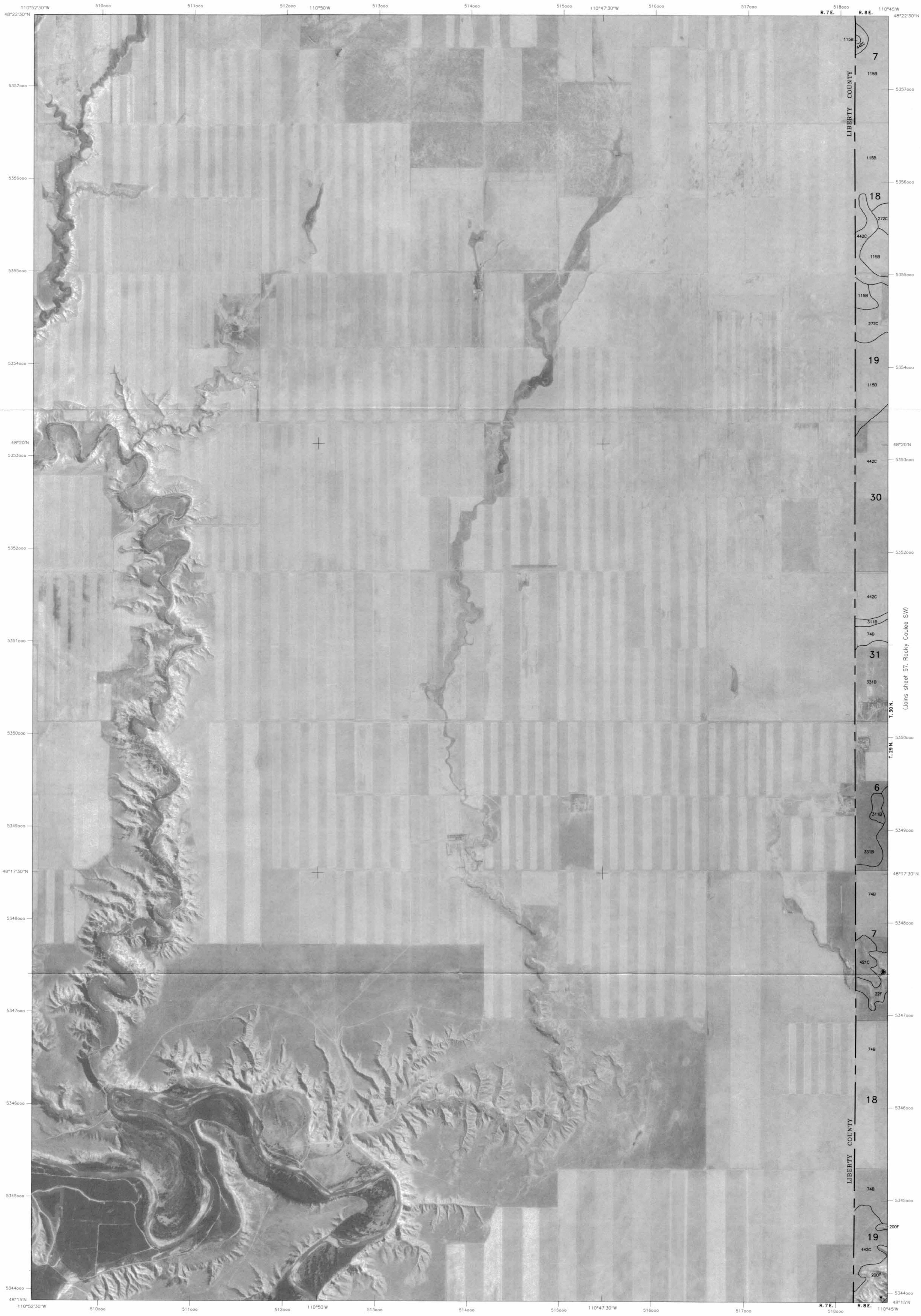
N

SHEET NUMBER 55 OF 71
HILL COUNTY, MONTANA
LLOYD NW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
POVERTY COULEE SE QUADRANGLE
SHEET NUMBER 56
7.5 MINUTE SERIES

(Joins sheet 44, Poverty Coulee NE)



(Joins sheet 67, Penzer School)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 56 OF 71
HILL COUNTY, MONTANA
POVERTY COULEE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
ROCKY COULEE SW QUADRANGLE
SHEET NUMBER 57
7.5 MINUTE SERIES

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 57 OF 71
HILL COUNTY, MONTANA
ROCKY COULEE SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

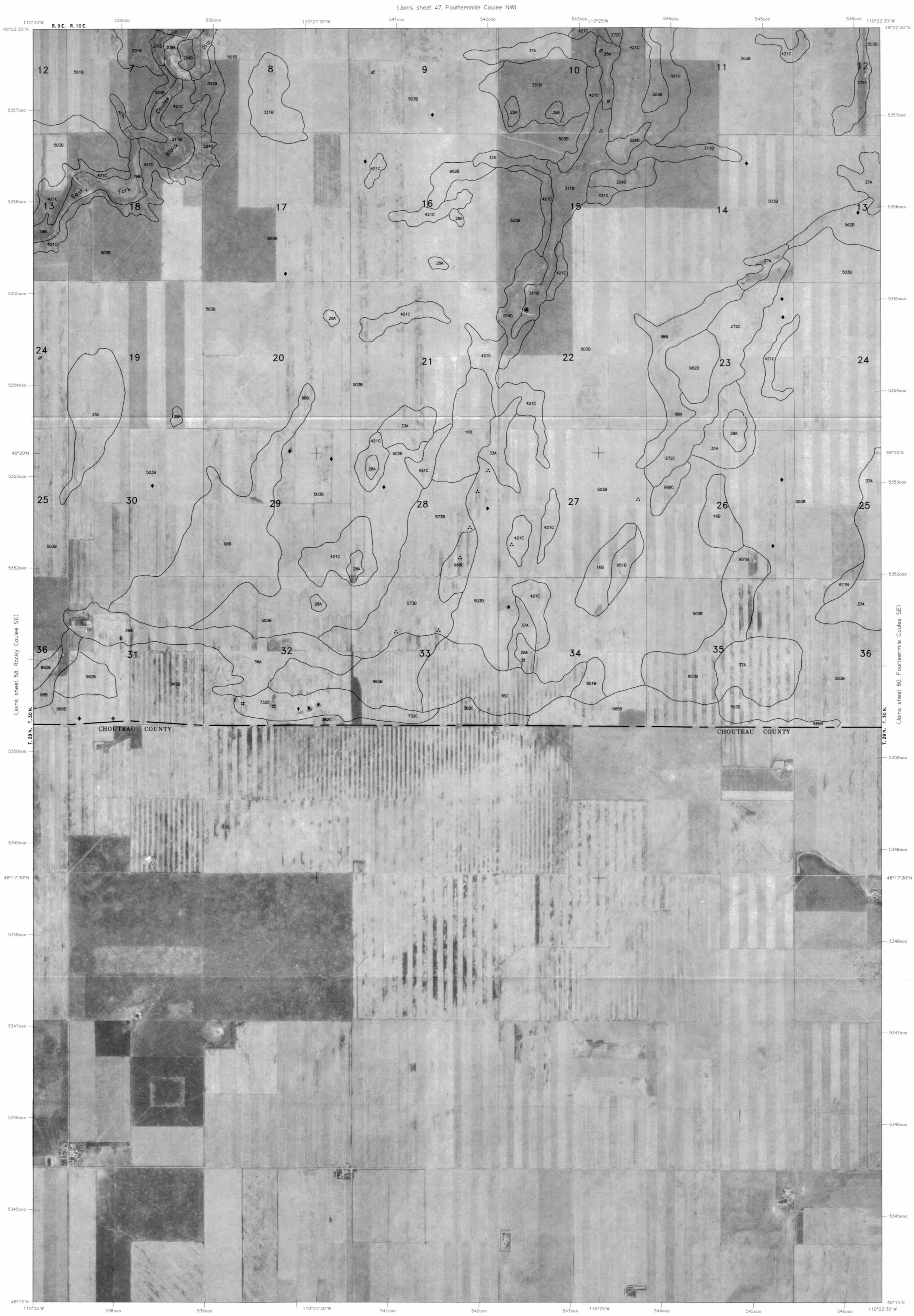
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 58 OF 71
HILL COUNTY, MONTANA
ROCKY COULEE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
FOURTEENMILE COULEE SW QUADRANGLE
SHEET NUMBER 59
7.5 MINUTE SERIES



1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 59 OF 71
HILL COUNTY, MONTANA
FOURTEENMILE COULEE SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
FOURTEENMILE COULEE SE QUADRANGLE
SHEET NUMBER 60
7.5 MINUTE SERIES

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974—1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 60 OF 71
HILL COUNTY, MONTANA
FOURTEENMILE COULEE SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
LONESOME LAKE QUADRANGLE
SHEET NUMBER 61
7.5 MINUTE SERIES

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

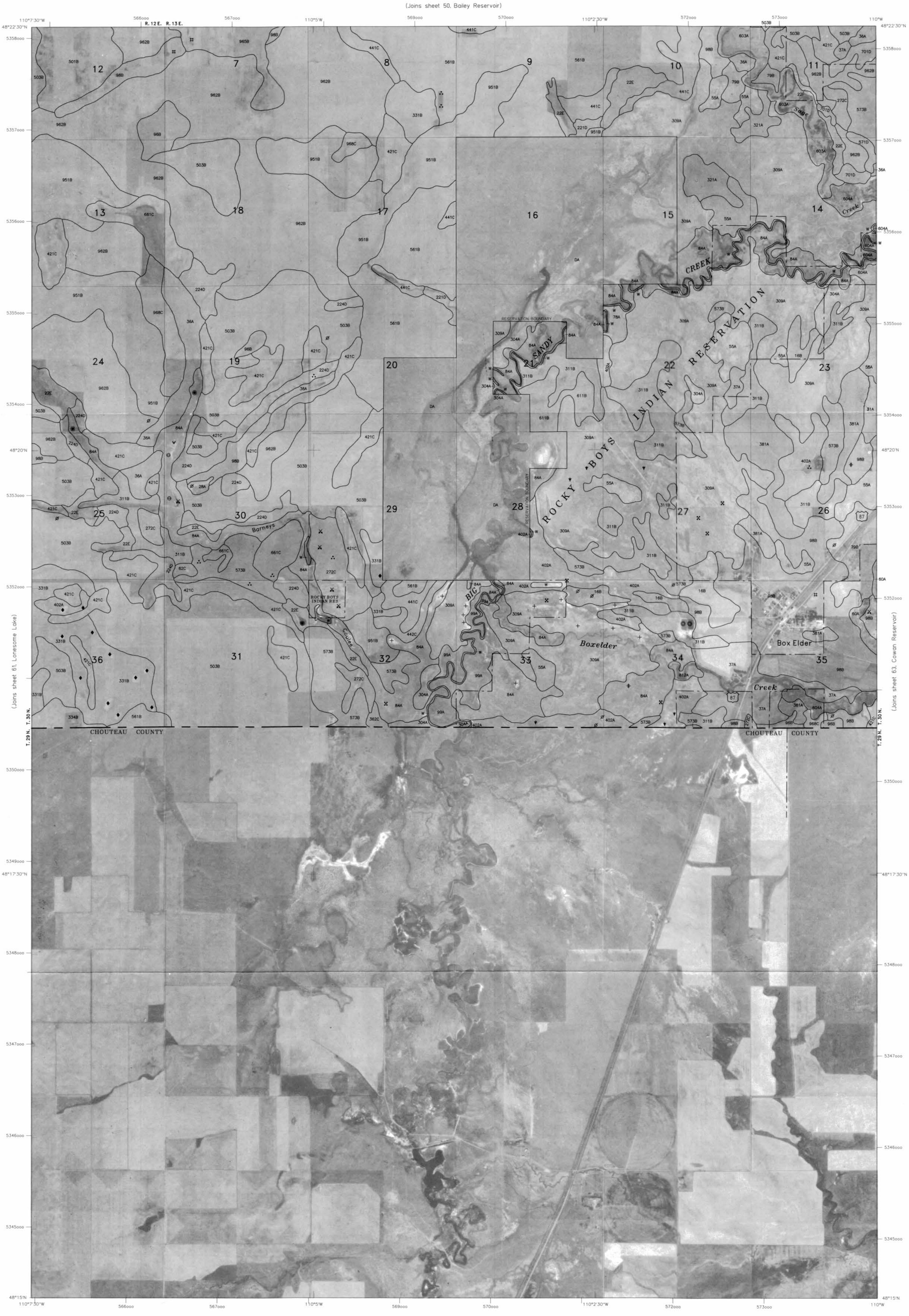
N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 61 OF 71
HILL COUNTY, MONTANA
LONESOME LAKE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE



1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

N

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974–1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 62 OF 71
HILL COUNTY, MONTANA
BOX ELDER QUADRANGLE

(Joins sheet 51, Laredo)

(Joins sheet 62, Box Elder)

(Joins sheet 64, Rocky Boy)

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1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 63 OF 71
HILL COUNTY, MONTANA
COWAN RESERVOIR QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
ROCKY BOY QUADRANGLE
SHEET NUMBER 64
7.5 MINUTE SERIES

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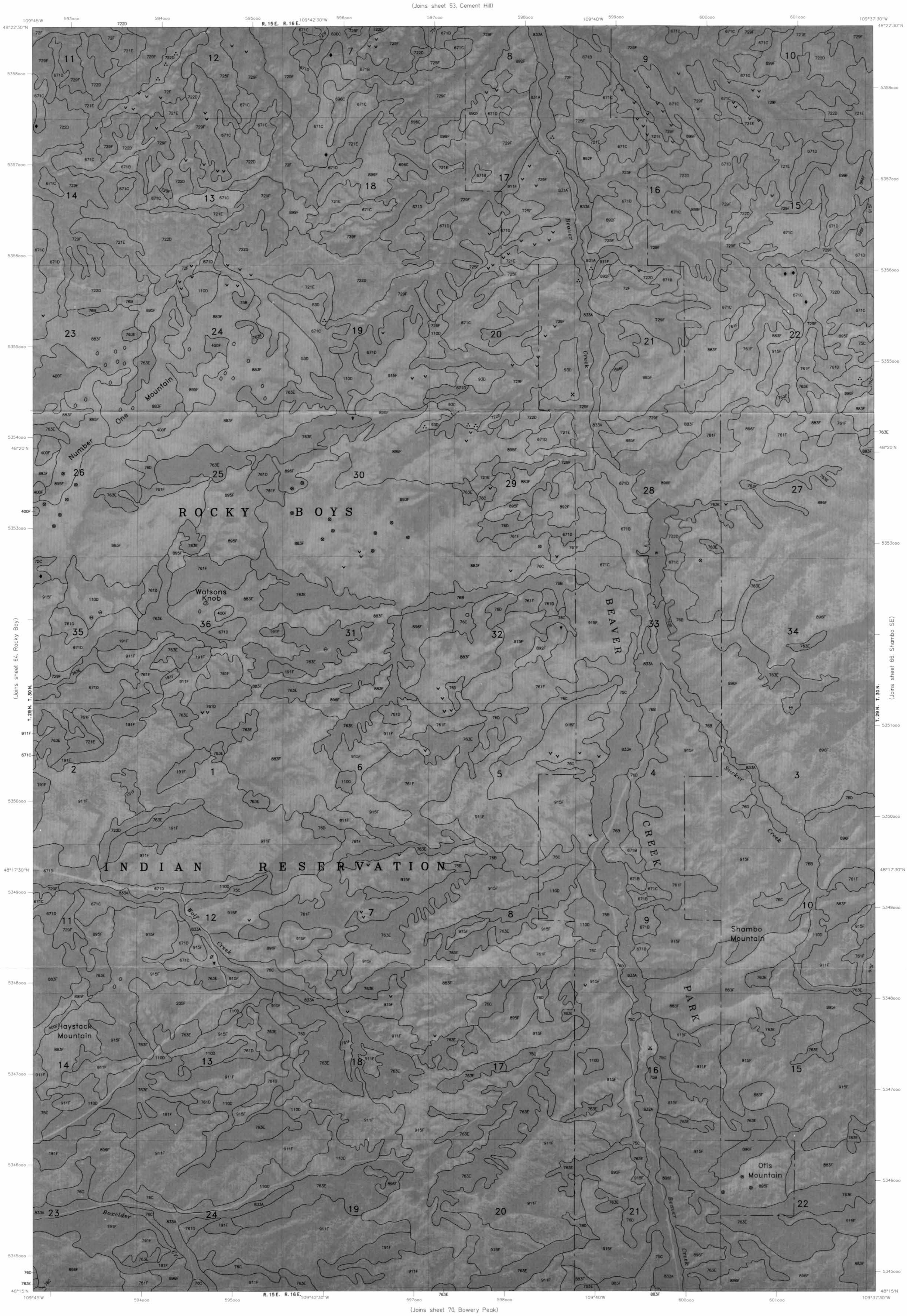
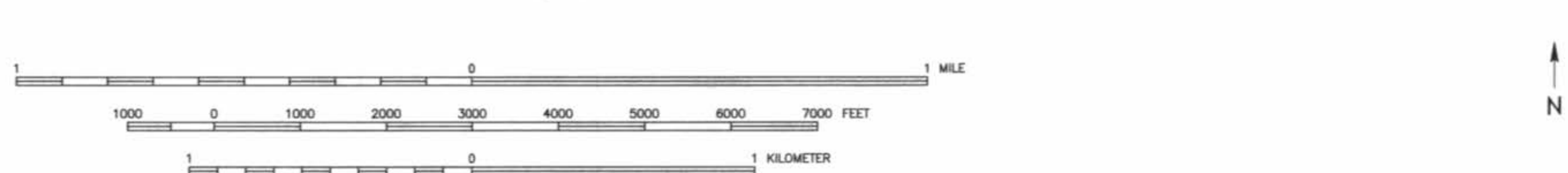
Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 64 OF 71
HILL COUNTY, MONTANA
ROCKY BOY QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE





Scale 1:24000

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Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 65 OF 71
HILL COUNTY, MONTANA
BEARPAW LAKE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
SHAMBO SE QUADRANGLE
SHEET NUMBER 66
7.5 MINUTE SERIES

(Joins sheet 54, Shambo NE)

(Joins sheet 71, Big John Butte)

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
Scale 1:24000

N

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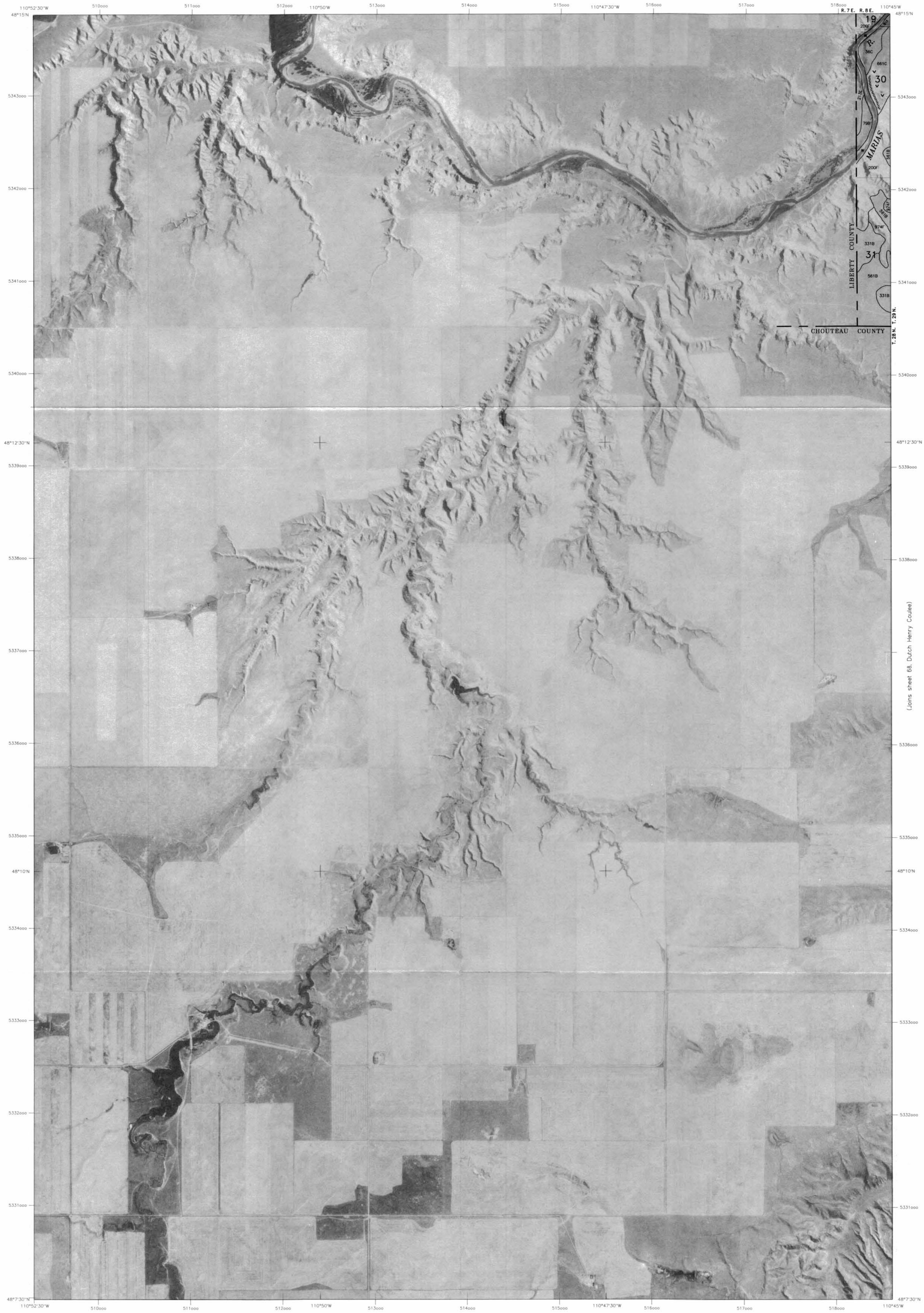
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 66 OF 71
HILL COUNTY, MONTANA
SHAMBO SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
PENZER SCHOOL QUADRANGLE
SHEET NUMBER 67
7.5 MINUTE SERIES

(Joins sheet 56, Poverty Coulee SE)



1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:24000

N

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Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 67 OF 71
HILL COUNTY, MONTANA
PENZER SCHOOL QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA
DUTCH HENRY COULEE QUADRANGLE
SHEET NUMBER 68
7.5 MINUTE SERIES

(Joins sheet 57, Rocky Coulee SW)

(Joins sheet 67, Penzer School)

Scale 1:24000

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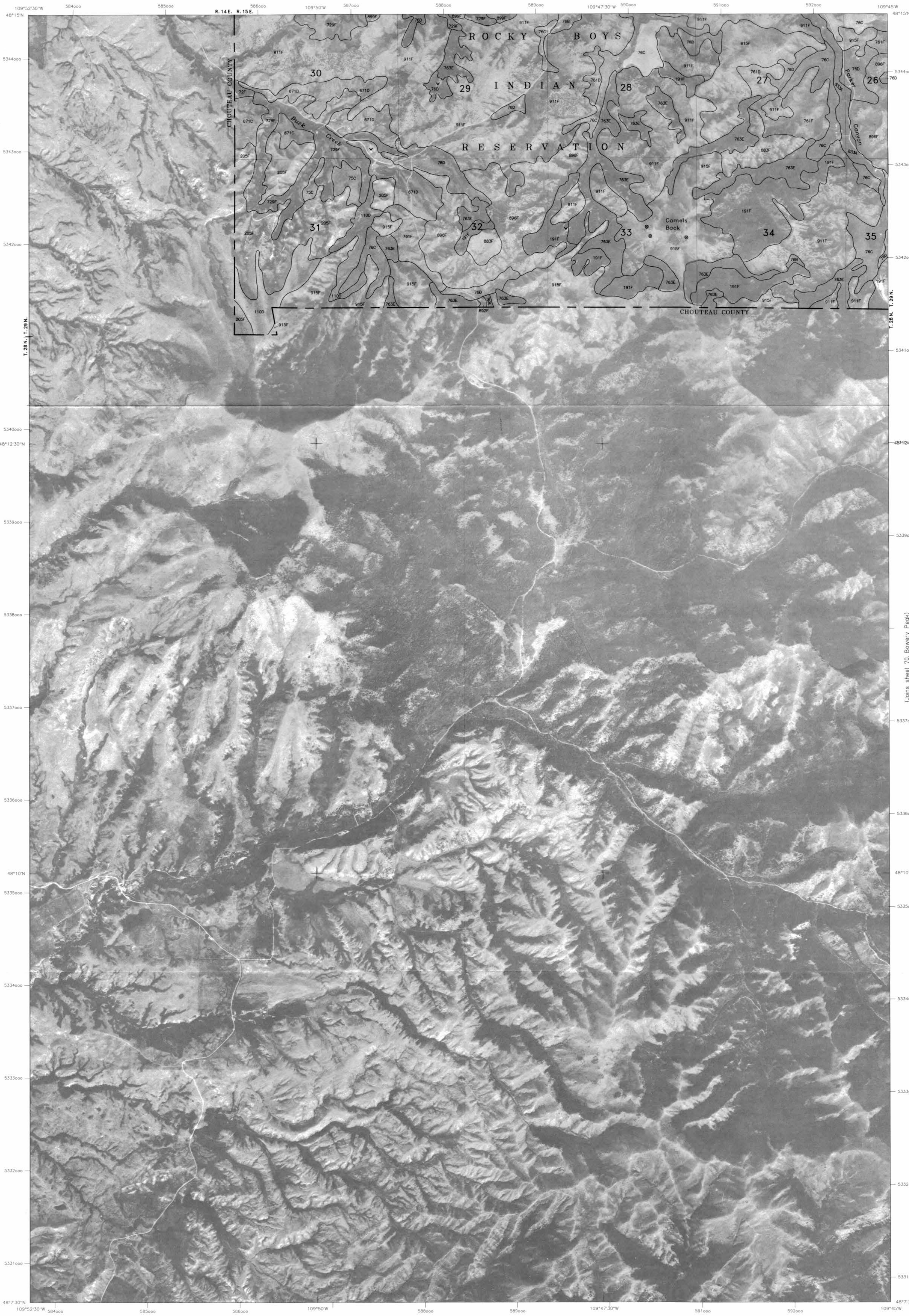
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 68 OF 71
HILL COUNTY, MONTANA
DUTCH HENRY COULEE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 64, Rocky Boy)



(Joins sheet 70, Bowery Peak)

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
Scale 1:24000

N

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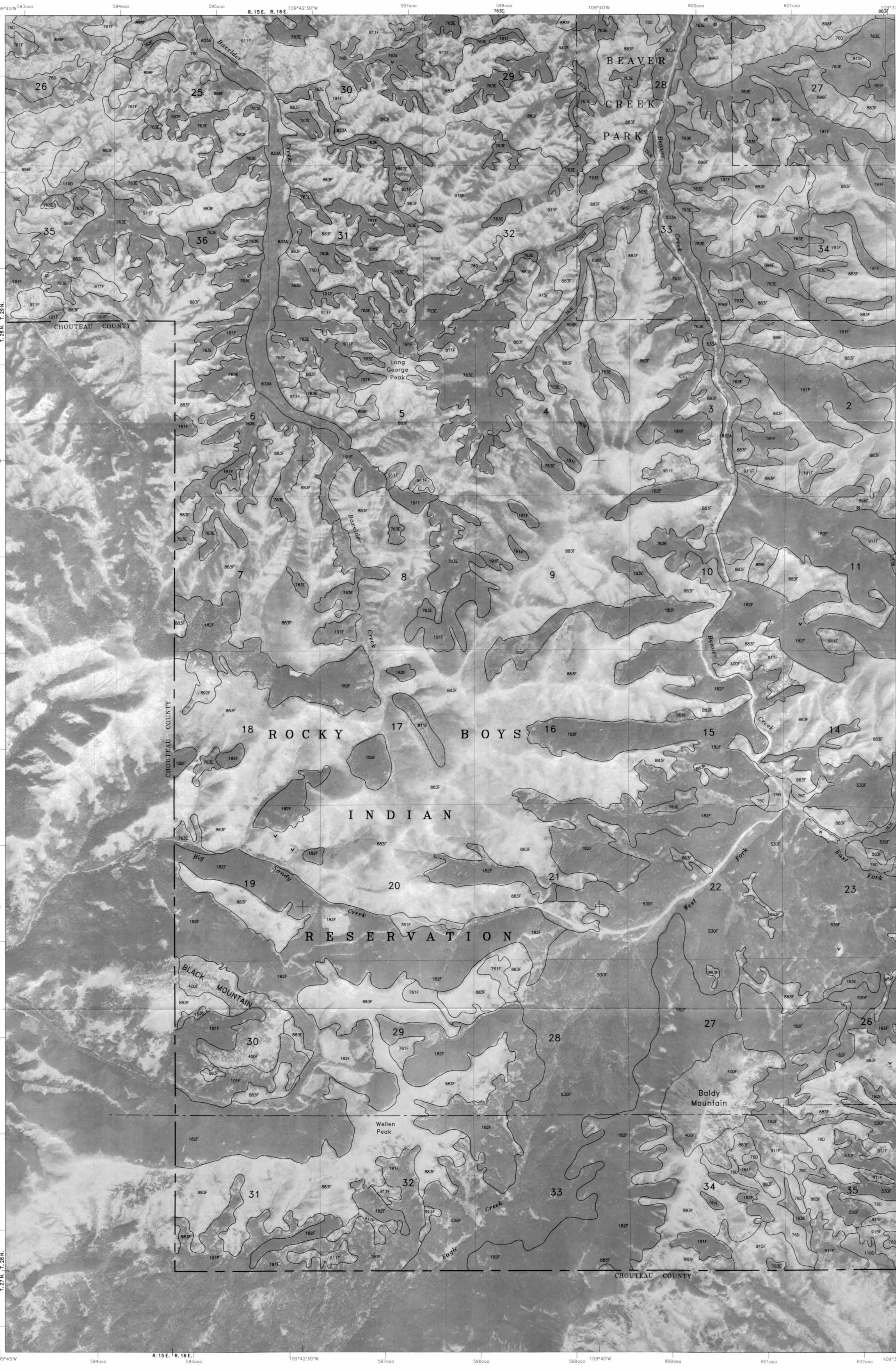
Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

SHEET NUMBER 69 OF 71
HILL COUNTY, MONTANA
CENTENNIAL MOUNTAIN QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

(Joins sheet 65, Bearpaw Lake)



Scale 1:24000

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Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

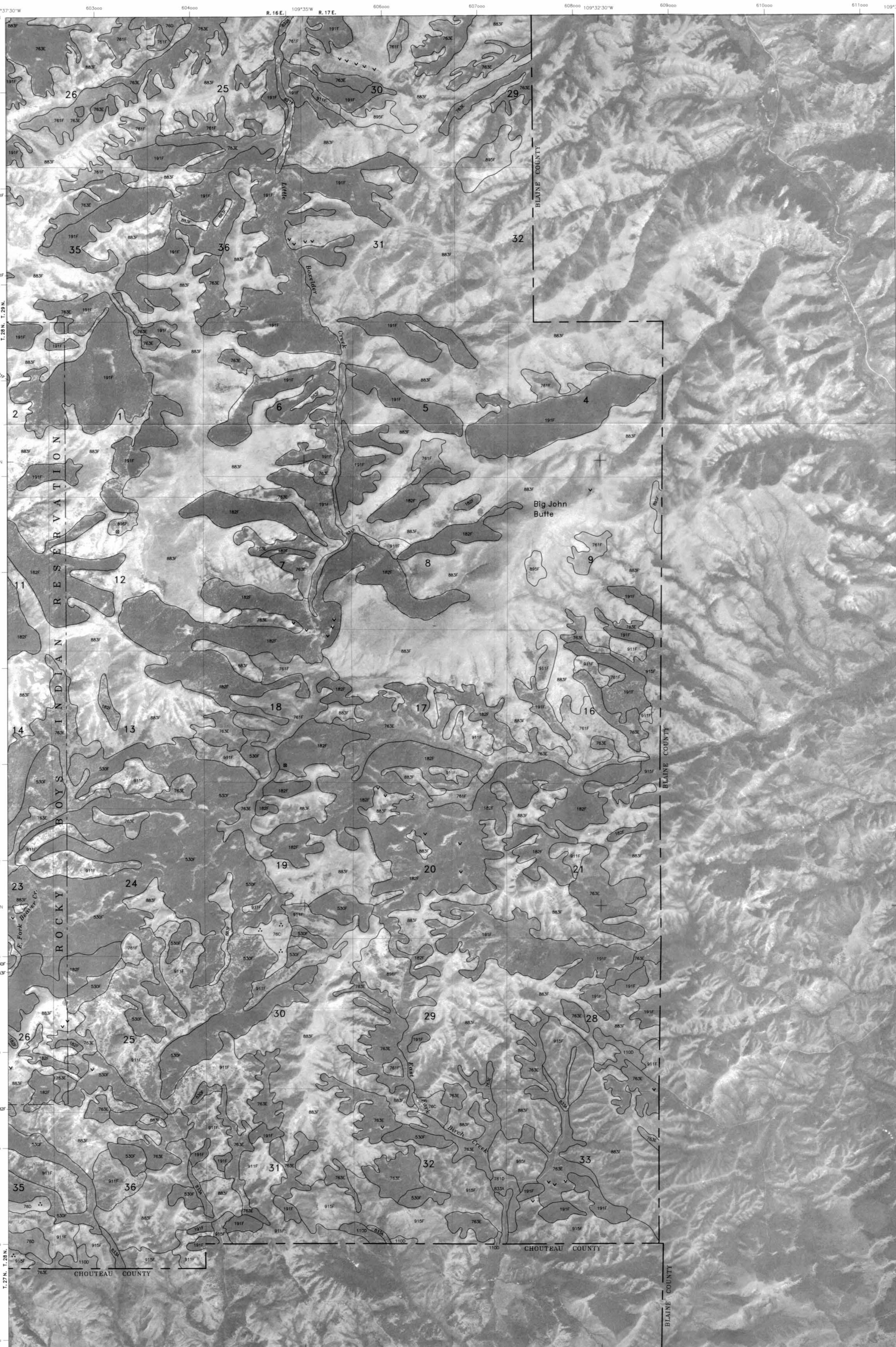
SHEET NUMBER 70 OF 71
HILL COUNTY, MONTANA
BOWERY PEAK QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HILL COUNTY, MONTANA

BIG JOHN BUTTE QUADRANGLE
SHEET NUMBER 71
7.5 MINUTE SERIES

(Joins sheet 66, Shambo SE)



1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

Scale 1:24000

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Digital Data: UTM Coordinate System Zone: 12
Polyconic Projection
1927 North American Datum

N

SHEET NUMBER 71 OF 71
HILL COUNTY, MONTANA
BIG JOHN BUTTE QUADRANGLE